

**Abstract Submission Deadline: October 7, 2011**

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**OCEAN**  
**SCIENCES**  
**MEETING**



**February 20–24, 2012**

**Salt Palace Convention Center**  
**Salt Lake City, Utah, USA**

Visit [www.sgmeet.com/osm2012](http://www.sgmeet.com/osm2012)  
or contact [osm2012@sgmeet.com](mailto:osm2012@sgmeet.com) for more information.



THE OCEANOGRAPHY SOCIETY

**ASLO**

 **AGU**  
American Geophysical Union

**CALL FOR PAPERS**



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## 2012 Ocean Sciences Meeting Call for Papers

20 – 24 February 2012, Salt Lake City, Utah, USA

This joint meeting is an international gathering of more than 4,000 attendees and is being sponsored by TOS, AGU and ASLO.

TOS, AGU and ASLO invite the submission of abstracts for oral and poster presentation. You must submit before the abstract deadline of 23:59 pm Central Daylight Time on 7 October 2011 (04:59 Greenwich Mean Time on 8 October 2011) in order for your abstract to be considered. Registration and payment of all fees are due at the time of abstract submission and are payable in U.S. Dollars. Links to TOS, AGU and ASLO websites will be provided so that you may join or renew membership in one or more societies to take advantage of the discounted registration rate for participating society members.

### Summary of Important Dates

Call for Papers Issued.....	Summer 2011
Abstract Submission Deadline and	
Early Registration Ends.....	7 October 2011
Authors Notified .....	December 2011
Student & Early Career Travel Awardees Notified.....	December 2011
Program Schedule Posted .....	January 2012
Meeting.....	20 – 24 February 2012

### Meeting Sponsors

#### TOS

The Oceanography Society was founded in 1988 to disseminate knowledge of oceanography and its application through research and education, to promote communication among oceanographers, and to provide a constituency for consensus-building across all the disciplines of the field. In addition to sponsoring scientific conferences, TOS presents prestigious awards such as The Walter Munk Award presented in recognition of distinguished research in ocean acoustics, and The Jerlov Award for contributions to the field of ocean optics. OCEANOGRAPHY magazine, published quarterly by TOS, has become widely respected throughout the marine science community.

#### AGU

The American Geophysical Union (AGU) is an international scientific society with over 60,000 members representing over 148 countries, committed to advancing Earth and Space science. Established in 1919 as a committee within the National Research Council of the National Academy of Sciences, AGU was independently incorporated in 1972. Since its founding, AGU is dedicated to furthering the sciences of geophysics through the individual efforts of our members and in cooperation with other national and international scientific organizations. These goals are met through publishing scientific journals and other technical publications, sponsoring scientific meetings of various sizes throughout the year and a variety of other educational and scientific activities.

AGU galvanizes a community of Earth and space scientists that collaboratively advances and communicates science and its power to ensure a sustainable future.

#### ASLO

For more than 50 years, ASLO has been a leading professional organization for researchers and educators in the field of aquatic science, working to provide for their needs at all phases of professional development. ASLO is best known for its highly rated research journals, its interdisciplinary meetings and its special symposia. The society supports increasingly important programs in public education and outreach and public policy. It strives to encourage student participation and to increase opportunities for minorities in the aquatic sciences.

Historically, ASLO has been known as The American Society of Limnology and Oceanography. In 2011, the ASLO membership voted overwhelmingly in favor of changing the name of the society to the Association for the Sciences of Limnology and Oceanography to better represent its international membership.

### 2012 OSM Meeting Organizers

Co-Chairs:

#### Mel Briscoe (TOS)

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## The Scientific Program

The Scientific Planning Committee is developing a program that will cover a wide range of topics in aquatic sciences. Please continue to check the conference web site (<http://www.sgmeet.com/osm2012>) for up-to-date information and consult the program that will be posted on the website approximately four weeks prior to the meeting. A printed copy of the program will be handed out at the conference.

Abstracts of papers presented during the meeting will be published on the meeting website and in PDF format for downloading. Abstracts also will be archived following the meeting. An abstract book will not be published.

## Plenary Lectures and Presentations

Dr. Mark R. Abbott, Oregon State University

*Graduate Education in the Ocean Sciences*

Mark R. Abbott is Dean and Professor in the College of Oceanic and Atmospheric Sciences at Oregon State University. He received his B.S. in Conservation of Natural Resources from the University of California, Berkeley, in 1974 and his Ph.D. in Ecology from the University of California, Davis, in 1978. He has been at OSU since 1988 and has been Dean of the College since 2001. Prior to coming to OSU, he was a member of the technical staff at the Jet Propulsion Laboratory and a research oceanographer at Scripps Institution of Oceanography. His research focuses on the interaction of biological and physical processes in the upper ocean and relies on both remote sensing and

field observations. His work led to the inclusion of chlorophyll fluorescence bands in MODIS (the Moderate Resolution Imaging Spectroradiometer on NASA's EOS Terra and Aqua satellites) to support next-generation ocean primary productivity algorithms that used these fluorescence data to estimate the physiological health of upper ocean phytoplankton. He is funded by the Office of Naval Research (ONR) to explore advanced computer architectures for use in undersea platforms. He is serving a six-year term on the National Science Board, which oversees the National Science Foundation and provides scientific advice to the White House and to Congress. He is vice chair of the Oregon Global Warming Commission, which is leading the state's efforts in mitigation and adaptation strategies in response to climate change. He is a member of the Board of Trustees for the Consortium for Ocean Leadership as well as the Board of Trustees for the University Corporation for Atmospheric Research. He is President-Elect of The Oceanography Society.

Dr. Kelly Benoit-Bird, Oregon State University

*Causes and Consequences of Heterogeneity of Organisms in the Ocean: From Phytoplankton to Dolphins*

Dr. Kelly Benoit-Bird, an Associate Professor in the College of Oceanic and Atmospheric Sciences at Oregon State University, is the author or co-author of more than 35 journal publications applying acoustics to study the ecology of pelagic ocean ecosystems. Her work examines a wide range of animals including zooplankton, fish, squid, and marine mammals, in all cases emphasizing the mechanisms creating spatial and temporal dynamics in pelagic marine ecosystems, the effects these dynamics have on interactions between organisms, and the mechanisms animals use to cope with these patterns. She has been involved in the development of several new optical and acoustical instruments and has made fundamental acoustical measurements of a variety of species in the process of addressing ecological processes in the ocean. In 2010, Kelly was awarded a MacArthur Fellowship, commonly referred to as a "genius award" for her "exceptional creativity and promise for important future advances based on a track record of significant accomplishment". Her work has also been recognized by the Acoustical Society of America with the 2009 R. Bruce Lindsay Award for "contributions to marine ecological acoustics" and the American Geophysical Union which awarded her the 2008 Ocean Sciences Early Career Award for "innovative application of acoustical techniques". Kelly is also the recipient of a United States Presidential Early Career Award for Scientists and Engineers, a Young Investigator Award from the U.S. Office of Naval Research, and a U.S. National Academy of Sciences Kavli Frontiers Fellowship.

Dr. Damian Chapman, Stony Brook University

*Biology in a Bowl: Studying Sharks to Save Them from Becoming Shark Fin Soup*

Dr. Damian Chapman is a shark scientist with the Institute for Ocean Conservation Science at Stony Brook University. His research includes development of genetic testing for tissue identification from the great white shark. This led to a successful proposal to list the great white species on the Convention on International Trade in Endangered Species (CITES). He is the author or co-author of numerous journal publications regarding a variety of sharks and their relatives. Dr. Chapman received his doctorate from Nova Southeastern University in 2007.

Dr. Mick Follows, Massachusetts Institute of Technology

*Modeling Marine Microbes: From Molecules to Ecosystems*

Mick Follows is an oceanographer working in the Department of Earth, Atmospheric and Planetary Sciences at the Massachusetts Institute of Technology. He studied Physics as an undergraduate at the University of Leeds in the UK, and earned a Ph.D. in Atmospheric Sciences at the University of East Anglia in 1991. After a year as a Royal Society Post-doctoral Fellow hosted at the Max Planck Institute for Atmospheric Chemistry in Mainz, Germany, working on models of ozone in the lower atmosphere, he joined what is now the Program in Atmospheres, Oceans and Climate at MIT as a post-doc in 1992 and began studying ocean biogeochemical cycles. He has remained there since and is now a Senior Research Scientist. He uses data analysis, simple models and numerical simulations to understand and interpret the global ocean cycles of elements including carbon and iron. Fascinated by the biological and ecological aspects of marine biogeochemical cycles, he has spent recent years learning about and modeling marine micro-organisms and the organization of their communities in the ocean.

Dr. Chris Reddy, Woods Hole Oceanographic Institution

*How Did We Do: Academia's Contributions to the Gulf of Mexico Oil Spill*

Christopher Reddy is a senior scientist in the Department of Marine Chemistry and Geochemistry and Director of the Coastal Ocean Institute at Woods Hole Oceanographic Institution. He studies oil spills, including those that have occurred in 1969, 1974, 1996, 2003, 2007 (two), and the *Deepwater Horizon*. According to a 2010 survey by Thomson Reuters, Dr. Reddy is one of the top cited and published scientists studying oil spill effects.

He has testified once for the *National Commission on the BP Deepwater Horizon*, twice for US Congress on the *Deepwater Horizon*, and briefed numerous staffers and leaders in the executive branch. Dr. Reddy has written eight op-eds on the *Deepwater Horizon*. He was an academic liaison at the *Unified Area Command* during the *Deepwater Horizon*.

Dr. Reddy has received many honors including being a Kavli Fellow, awarded in 2009 and 2010 by the National Academy of Sciences, Aldo Leopold Leadership Fellow (2006), and Office of Naval Research Young Investigator Program Award (2003). He received his Ph.D. in chemical oceanography from the University of Rhode Island in 1997 and an executive education certificate from MIT Sloan's School of Business in 2010.

## About Salt Lake City

Salt Lake City is a winter sports paradise, offering world-class skiing - even at night - within an hour's drive. The city is home to several museums and art galleries, and hosts numerous cultural performances and professional sports competitions. The Salt Lake Convention and Visitors Bureau (<http://www.visitsaltlake.com/visit/>) offers detailed information on places to go and area activities.

Salt Lake City offers a unique blend of urban oasis and world class recreational facilities nestled in the surrounding mountains. With an elevation of 4,330 feet, Salt Lake City is temperately cold with average daily high temperatures around 44 °F. Temperatures in the mountain areas may be as much as 20 degrees cooler.

February is an ideal month for skiing. Special ski packages will be available through the Ski Salt Lake Superpass. Up-to-date information may be accessed at <http://www.visitsaltlake.com/ski/> after September 2011.

Utah is in the Mountain Time Zone.

Salt Lake City offers a wide variety of restaurants, bars, pubs and night clubs within the downtown area and beyond. Restaurants, bars and clubs all offer full bar service. The minimum age to purchase or consume alcohol in Salt Lake City is 21. Most clubs and lounges in the City are open from 11:00 am until 2 am.

## About the Meeting Site

The Salt Palace Convention Center (SPCC) combines spacious meeting facilities with 21st-century environmental technology. Containing 675,000 square feet of conference area, management strives to reduce, reuse and recycle. The 2006 expansion of SPCC was awarded the U.S. Green Building Council's Silver LEED status for being designed and constructed utilizing environmentally responsible techniques. A key component of this planning utilizes water efficient landscaping which has reduced anticipated water needs for the facility's landscaping by 50 percent.

Hotels, restaurants and other venues are in close proximity to the Salt Palace Convention Center. Over 140 restaurants, bars, nightclubs and brew pubs are within walking distance. The TRAX light rail system offers free fares in the convention district.

## Session Information

Sessions for the meeting are organized into the following 18 categories:

1. Geology and geophysics
2. Physical oceanography and limnology
3. Biological oceanography, aquatic biology
4. Chemical oceanography, aquatic chemistry
5. Watersheds, lakes, rivers, estuaries
6. Nearshore and coastal regions
7. High latitude studies
8. Climate change, environmental change, ocean acidification
9. Ecosystems: processes, assessment, and management
10. Education, scientific outreach, scientific workforce
11. Ocean policy, resource management
12. Optics, acoustics, remote sensing
13. Observatories, operational oceanography, new technology
14. Oil Spill, Gulf of Mexico
15. Miscellaneous
16. Data Management
17. Air-Sea Interactions
18. Bio-geochemistry

Sessions have been categorized for reference by topic. A set of numbers appears in parenthesis following each session description. These numbers indicate the category to which the session pertains.

### 001: Gases as Tracers of Oceanic Processes

*Organizers:* Roberta Hamme, University of Victoria, rhamme@uvic.ca; David Ho, University of Hawaii Manoa, ho@hawaii.edu

This session seeks to bring together the gas tracer community to exchange knowledge regarding new observations, applications,

and/or modeling of gases as tracers for understanding oceanic physical and biogeochemical processes. We welcome abstracts on a variety of topics including distributions of natural and anthropogenic gases and their isotopes in the ocean, atmospheric measurements as they relate to ocean processes, tracer release experiments, and process studies of air-sea transfer mechanisms. Presentations on observations, method development, modeling, and data synthesis and interpretation are all encouraged. (2, 4, 17)

## 002: ASLOMP Student Symposium

*Organizers:* Benjamin Cuker, Hampton University, benjamin.cuker@hamptonu.edu; Deidre Gibson, Hampton University, deidre.gibson@hamptonu.edu

This session is sponsored by the ASLO Multicultural Program. It provides undergraduate and beginning graduate students an opportunity to present their work in an oral session with a friendly and supportive audience. Any student attending the conference who has not before presented in the student symposium or in a regular oral session may submit their abstract for this session. Thus the session is open to all students that meet this criterion, regardless of their affiliation with the Multicultural Program. We look forward to a mix of students from all backgrounds and interests. (10)

## 003: The Cold Frontline of Marine Global Climate Change: The Response of Mid and High-Latitude Calcifiers

*Organizers:* Nick Kamenos, University of Glasgow, nick.kamenos@glasgow.ac.uk; Maggie Cusack, University of Glasgow, maggie.cusack@glasgow.ac.uk; J. Murray Roberts, Heriot-Watt University, J.M.Roberts@hw.ac.uk

Recent research has highlighted the large variability of responses by calcifying marine biota to changes in their physical environment. Critically, those calcifiers provide important ecosystem services and in addition, studies using novel environmental proxies from cold-water carbonates are helping form our understanding of environmental variability and responses to past periods of rapid climate change. This session will promote a more complete understanding of how mid- to high-latitude biomineralizing organisms including corals, coralline algae, bryozoans and mussels respond to environmental changes such as rapid climate change, ocean acidification, hypoxia, etc. The session will include sub-organism to ecosystem level processes, evidence for acclimation and geochemical proxy records. It will combine palaeo aspects with research investigating present-day biotic and physical adaptations and the responses of services provided by biogenic habitats. The aim is to provide the holistic approach required to further our understanding of mid and high-latitude calcifier responses to global change. (1, 3, 7, 8)

## 004: The Southern Ocean and Its Role in the Climate System

*Organizers:* Stephanie Downes, Princeton University, sdownes@princeton.edu; Nicole Jeffery, Los Alamos National Laboratory, njeffery@lanl.gov; Joellen Russell, University of Arizona, jrussell@email.arizona.edu; Wilbert Weijer, Los Alamos National Laboratory, wilbert@lanl.gov

Over the past decade, the climate dynamics, biogeochemistry and physical oceanographic communities have highlighted the Southern Ocean as a key player in the climate system.

Thus, understanding the processes that shape the Southern Ocean mean state, variability, and response to external forcing is essential for our understanding of the climate system as a whole. Data collections have expanded significantly over the past decade, and modeling efforts have advanced through Earth System Model development, data assimilation solutions, and process models. These new developments require investigation of how (or whether) the representation of the Southern Ocean has been improved using a combination of model-model and model-data comparisons. The goal of this session is to present modeling and/or data efforts that investigate all aspects of the Southern Ocean, including its mixing and mesoscale processes, large-scale circulation, ocean-atmosphere and ocean-ice interactions, and biogeochemical processes. We particularly encourage analyses using models for the upcoming IPCC Fifth Assessment Report and assimilated models. (2, 4, 7, 8, 18)

## 005: Metal Speciation in the Ocean: Metal-Binding Ligand Composition and Role in the Transport of Metals through the Marine Environment

*Organizers:* Sylvia Sander, University of Otago, sylvia.sander@otago.ac.nz; Constant van den Berg, University of Liverpool, vandenbergliverpool.ac.uk; Kristen Buck, Bermuda Institute of Ocean Sciences, kristen.buck@bios.edu

The biogenic trace metals iron, cobalt, zinc, nickel and copper are complexed by organic ligands in the marine system, which can influence trace metal solubility and bioavailability. Little is known about the composition of these metal-binding ligands, although siderophores, thiols, humic substances and saccharides have been identified. There is evidence that this organic complexation helps transport trace metals from their source (hydrothermal vents, estuaries, etc.) to the open ocean. Dynamic aspects related to photochemical changes in metal speciation are also being recognised. This session welcomes abstract submissions related to all aspects of metal speciation in the oceans, and particularly to identifying sources and cycling processes of metal-binding ligands. (4)

## 006: Advances in Coastal Ocean Modeling, Analysis, and Prediction

*Organizers:* Villy Kourafalou, University of Miami/RSMAS, vkourafalou@rsmas.miami.edu; Pierre De Mey, LEGOS - Laboratoire d'Etudes en Géophysique et Oceanographie Spatiales, demey-redir@neyak.org; Ruoying He, North Carolina State University, rhe@ncsu.edu; Alex Kurapov, Oregon State University, kurapov@coas.oregonstate.edu

Downscaling and extending predictability in coastal and shelf seas are two of the objectives of the GODAE OceanView (GOV) initiative through its Coastal Ocean and Shelf Seas Task Team (COSSTT). Broad participation and international coordination of interdisciplinary coastal and shelf models nested in data assimilative large scale models is a COSSTT priority. This session will provide a forum for multi-scale hydrodynamic modeling and observational studies that aim toward scientific validation, prediction and operational applications of numerical models in coastal and shelf seas, leading to new understanding of multiscale nonlinear ocean processes. Applications of nested models, such as the influence of physical processes on ecosystem dynamics and interdisciplinary coastal predictions are also welcome. The session will promote the discussion of methodologies that lead to reliable coastal forecasts (such as

data assimilation, error analysis, influence of nesting, resolution and forcing), Observing System Simulation Experiments and the impact of sustainable, integrated modeling and observational networks that connect local, regional and global scales. Applications on lessons learned from prediction and/or hindcasts during the 2010 Deepwater Horizon oil spill in the Gulf of Mexico and the 2011 tsunami in Japan are particularly welcome. (2, 6, 13, 14)

### 007: High-Resolution Geochemical Proxies of Global Change: Progress, Problems, and Utility

*Organizers:* Alan D. Wanamaker Jr., Iowa State University, adw@iastate.edu; David P. Gillikin, Union College, gillikid@union.edu

Knowledge of climate and environmental change throughout geological time is derived from deep-sea and terrestrial records representing long time scales. However, while records of climate and environmental changes at long time scales are essential, high-resolution marine-based records at seasonal, annual, and decadal scales are equally important and under-represented in the literature. Much of what we know about past environments is based on the geochemical signature in various proxy archives. While substantial progress continues to be made in this area, specific obstacles and problems do exist. We encourage papers presenting geochemical records of global change, including calibration/validation studies, in biologic or inorganic carbonates and highly resolved (decadal resolution) sediments. Geochemical studies highlighting recent progress, problems, or utility are especially welcome. (1, 4, 8)

### 008: Arctic Ocean Boundary Currents: Observations, Theory and Modeling

*Organizers:* Mary-Louise Timmermans, Yale University, mary-louise.timmermans@yale.edu; Sheldon Bacon, National Oceanography Centre, Southampton, s.bacon@noc.ac.uk; Robert Pickart, Woods Hole Oceanographic Institution, rpickart@whoi.edu

Arctic Ocean boundary currents are central to the heat, freshwater and geochemical budgets of the Arctic system and can rapidly propagate and modify high-latitude climate signals. Their scales range from the Arctic Circumpolar Boundary Current, extending thousands of kilometers around the perimeter of the basin, to regional shelfbreak jets, such as those adjacent to the Chukchi, Beaufort, and Barents Seas. This session explores all aspects of Arctic basin boundary flows, including, but not limited to: seasonal and longer-term water-mass changes; governing dynamics; exchange processes linking the continental shelf and slope to the deep central basins, such as eddies, dense water flows and wind-forced circulation; and exchanges between Arctic boundary currents and the Pacific and Atlantic Oceans and coastal Arctic seas. We invite contributions that bring new insights into the system of boundary currents of the Arctic Ocean through observational, theoretical and modeling studies. (2, 7)

### 009: Autonomous Ocean Carbon Cycle Sensors: New Technology, Deployment Strategies and Data Analysis

*Organizers:* Mike DeGrandpre, University of Montana, michael.degrandpre@umontana.edu; Todd Martz, Scripps Institution of Oceanography, trmartz@ucsd.edu

Our methods for studying the ocean are constantly evolving, driven by the need to improve sensitivity, measurement

frequency, and spatial coverage, and to achieve these objectives at lower cost. Autonomous sensor technology has advanced rapidly in the past decade in response to these demands. This session focuses specifically on new autonomous carbon cycle sensors, recent studies that have used these sensors, and descriptions of deployment strategies. Analysis of data from in situ, autonomous shipboard or remote, e.g. satellite, measurements of any carbon-related parameters are welcomed. We also encourage posters that discuss strategies to most effectively utilize existing (e.g. Argo) and future (e.g. Ocean Observatory Initiative) autonomous platforms. (4, 13)

### 010: Ocean Observing Systems — What are we learning?

*Organizers:* Michael S. Tomlinson, University of Hawaii, School of Ocean and Earth Science and Technology, tomlinson86@q.com; Eric Heinen De Carlo, PhD, University of Hawaii, School of Ocean and Earth Science and Technology, edecarlo@soest.hawaii.edu; James T. Potemra, PhD, University of Hawaii, School of Ocean and Earth Science and Technology, jimpp@hawaii.edu

It has been 7 years since the first of eleven Regional Associations of Ocean Observing Systems (OOSs) in the United States came online and started providing data and information to their stakeholders and the general public. These OOSs provide valuable real-time, high-resolution data and information in support of environmental protection, ocean safety, and ocean economic benefits. In addition, the OOSs provide ocean scientists with access to large, multivariable, high temporal and spatial resolution datasets which enable us to better understand atmosphere-land-ocean interactions; the effects of extreme events (e.g., tsunamis, storms, spills); and larger scale phenomena such as ENSO, PDO, and important issues such as ocean acidification. In this session, we envision a combination of oral and poster presentations that focus on some of the most important findings obtained from OOS data across the nation to date, although we also encourage submissions from international colleagues involved in ocean observing efforts elsewhere. We want to emphasize the multidisciplinary nature of the OOS and the data collected and how these large data sets allow us to examine specific phenomena and resolve the effects of these phenomena spatially and temporally in detail that heretofore was not possible on such a large scale. (8, 13)

### 011: Biology, Biogeochemistry, and Bio-optics of the Pacific Sector of the Arctic Ocean

*Organizers:* Kevin R. Arrigo, Stanford University, arrigo@stanford.edu; Marcel Babin, Université Laval, Marcel.Babin@takuvik.ulaval.ca

Rapid changes in the physical environment of the Arctic Ocean over the last decade are likely to markedly alter its biology and biogeochemistry. Changes have been most extreme in the Pacific sector of the Arctic Ocean and, consequently, this area has received considerable scientific interest in recent years. Remote sensing studies suggest that as sea ice cover and the length of sea ice season has decreased, primary productivity in the pelagic environment has risen, particularly on continental shelves. However, associated changes within the sea ice ecosystem are not known. Unfortunately, satellite remote sensing in Arctic waters is challenging and an improved understanding of the optical characteristics of its surface waters and sea ice cover is sorely needed. The goal of this session is to present recent efforts to characterize ongoing changes in the biology and biogeochemistry in the Pacific sector of

the Arctic Ocean, using both field-based and satellite-based approaches, and relate these to changes in the physical environment, including sea ice. We also welcome results from work being done to improve our ability to monitor changes in this remote and difficult to sample environment using satellite measurements of ocean color, as was done during the Malina and ICESCAPE cruises. (3, 7, 12, 18)

## 012: The Chukchi Sea Region: Rapid Changes in the Pacific Gateway to the Arctic

*Organizers:* Jacqueline M. Grebmeier, University of Maryland Center for Environmental Science, jgrebmei@umces.edu; Russell R. Hopcroft, University of Alaska Fairbanks, hopcroft@ims.uaf.edu; Robert S. Pickart, Woods Hole Oceanographic Institution, rpickart@whoi.edu; Bill Williams, Institute of Ocean Sciences, DFO Canada, bill.williams@dfo-mpo.gc.ca

Over the last decade the Chukchi Sea has warmed significantly, experienced major reductions in seasonal sea ice cover, and responded to shifts in atmospheric forcing. These changes demonstrate the sea's vulnerability to climate perturbations and its interconnectivity to the Arctic and global oceans. Numerous scientific programs are underway with support from state and US government agencies, private industry, and via international efforts based in Canada, China, Japan, Korea, and Russia. These programs are rapidly increasing our understanding of the Pacific gateway to the Arctic and promise better system-level understanding. This session invites contributions on emerging results from field and modeling studies that implicate key ocean-atmosphere interactions, including sea ice dynamics, physical and biogeochemical processes in the water column, and biological response throughout the marine food web. Data on changes to external forcing that may promote marine species shifts or evidence of major ecosystem reorganizations are also welcome. This multidisciplinary and international session will provide a state of the art evaluation of the environmental status and trends of the Arctic's Pacific sector, including physical forcing, biogeochemical cycling, biological response, modeling and social-economic interactions. (2, 7, 8)

## 013: Oceanic Uptake of Heat and Greenhouse Gases: Dynamic and Thermodynamic Controls and Inferences from Tracers

*Organizers:* Geoffrey (Jake) Gebbie, Woods Hole Oceanographic Institution, ggebbie@whoi.edu; Mark Holzer, University of New South Wales, mholzer@unsw.edu.au; William Smethie, LDEO, Columbia University, bsmeth@ldeo.columbia.edu; Laure Zanna, University of Oxford, zanna@atm.ox.ac.uk

The oceans play a major role in climate, because they are a sink for heat and carbon capable of delaying the climatic response to forcing and thus affecting climate on all space and time scales. This session aims to further our understanding of how, when, and where the properties of the interior ocean are changing with a focus on the controls exerted by ocean dynamics and the constraints provided by observed transient and steady tracers. A key theme of the session is how tracers can inform us about the role of the oceans in climate variability and change. Contributions are solicited that present observational, theoretical, and/or modeling results from either of two general areas: (i) the role of ocean dynamics and thermodynamics in governing the uptake of heat, carbon and other tracers, including the relation to climate variability and change, and (ii) new observations of traditional and emerging trace

species, novel diagnostic techniques, and forward and inverse modeling approaches to use tracers to constrain dynamical and biogeochemical processes. (2, 4, 8)

## 014: Ocean Deoxygenation and Coastal Hypoxia in a Changing World

*Organizers:* Nancy N. Rabalais, Louisiana Universities Marine Consortium, nrabalais@lumcon.edu; Daniel Conley, GeoBiosphere Centre, Department of Geology, Lund University, daniel.conley@geol.lu.se; Francis Chan, Oregon State University, chanft@science.oregonstate.edu

The interaction of ocean warming and human activities in watersheds is increasing the occurrence, frequency and severity of oxygen deficiency in oceanic and coastal waters. Climate change is warming ocean waters and thereby reducing the solubility of oxygen and its availability to aerobic organisms. Human alterations to hydrology and nutrient flux further aggravate oxygen depletion in coastal waters. These interactions may in fact result in positive influences to aquatic ecosystems, but the overall result is expected to be negative impacts for oceanic waters, including expansion of oxygen minimum zones and coastal hypoxia. In addition, indications are that increases in deoxygenation will exacerbate ocean acidification. There is little doubt that deoxygenation is increasing around the globe, but these observations result primarily from new reports of oxygen deficiency in the literature. The long-term records for ocean deoxygenation and coastal hypoxia are limited, but these data with correlative information can tell us much about changing conditions and changes in oxygen concentrations in marine waters. This session focuses on long-term data for changing oxygen dynamics in marine waters, both hydrographic data sets and paleoindicators for decreasing oxygen concentrations with their ancillary data that point to causal relationships. (4, 6, 8, 9)

## 015: Nearshore Processes

*Organizers:* Jennifer L. Irish, Virginia Tech, jirish@vt.edu; Alex Apotsos, U.S. Geological Survey, aapotsos@gmail.com

Geomorphologically diverse nearshore regions are continuously evolving due to wind, waves, and varying water levels. These long-term processes are punctuated by devastating coastal storms and tsunamis that quickly reshape coastal areas. In this session we invite abstracts that focus on the dynamics of waves, tides, currents, turbulence, and sediment transport from the beach face to the shelf break along sandy, muddy or mixed sedimentary coasts and inlets. Topics of particular interest include: 1) sediment transport, 2) waves and wave-driven circulation, 3) coastal morphodynamics, 4) swash zone processes, 5) nearshore turbulence, and 6) extreme coastal events. Presentations concerning in situ and remote sensing observations, laboratory experimentation, theory, modeling, and model-data assimilation are encouraged. (1, 2, 6)

## 016: Dynamics and Observations of Submesoscale Oceanic Processes

*Organizers:* Tamay M. Ozgokmen, Rosenstiel School of Marine and Atmospheric Science, University of Miami, tozgokmen@rsmas.miami.edu; M. Jeroen Molemaker, University of California, Los Angeles, nmolem@atmos.ucla.edu; James C. McWilliams, University of California, Los Angeles, jcm@atmos.ucla.edu; Eric D'Asaro, University of Washington, dasaro@apl.washington.edu

An improved insight in oceanic processes on lateral scales of 100 m to 10 km and temporal scales ranging from hours to days is important to develop a better understanding of multi-scale interactions and energy balance in the ocean, for biogeochemical transport, autonomous vehicles, navigation, acoustic propagation, dispersion and mitigation of pollutants. Currently, these processes are not well understood. This is in part because the submesoscale regime corresponds to a transition from the better studied geostrophic mesoscale to turbulent microscale, in which horizontal stirring and vertical mixing are linked. Submesoscale processes also pose a significant challenge to both observations and modeling, in that the interaction of a wide range of spatial and temporal scales must be captured simultaneously and internal wave signals understood. Several processes that have been recognized as potential contributors to submesoscale variability are loss of balance through ageostrophic instabilities, mixed layer instabilities and vortical modes created by breaking internal gravity waves. We welcome presentations related to developments in theory, field observations and numerical modeling studies that help shed insight into submesoscale oceanic processes. (2)

#### 020: Theory, Modelling, and Observations of Remote-sensed Propagating Waves and Eddies

*Organizers:* Dr. Subrahmanyam Bulusu, University of South Carolina, sbulusu@geol.sc.edu; Dr. Remi Tailleux, University of Reading, R.G.J.Tailleux@reading.ac.uk

Westward propagating Rossby waves and eddies are the most dominant feature of sea-surface height (SSH) variability on seasonal to decadal time scales, but other propagating waves such as Kelvin-waves or barotropic Rossby waves are also present, as well as observable in other remote-sensed products, such as sea-surface temperature (SST), chlorophyll, and even sea-surface salinity (SSS). Waves and other propagating features are of fundamental importance for the large-scale circulation owing to their role: 1) in the adjustment of the oceans to changes in the buoyancy and wind forcing, 2) in significantly contributing to the meridional transport of heat, salt, and nutrients. As a result, it is essential to represent such signals in numerical ocean general circulation models used for climate change studies. For this to be successful, however, much remains to be understood about the formation, propagation, decay, dynamics, and vertical structure of such signals. This session encourages contributions using Remote Sensing observations (altimetry, SST, and ocean color) and in-situ data (e.g., ARGO floats), as well as theoretical and modelling work, that can help refine the description and understanding of such waves and eddies, and how the surface signature of such signals relate to their vertical structure. (2, 12)

#### 021: Modeling and Observing the Tides in the Ocean

*Organizers:* James Richman, Naval Research Laboratory, richman@nrlssc.navy.mil; Brian Arbic, University of Michigan, arbic@umich.edu; Patrick Cummins, Institute of Ocean Sciences, Patrick.Cummins@dfo-mpo.gc.ca; Malte Mueller, University of Victoria, mmueller@uvic.ca

A resurgence of interest in ocean tides has occurred in the past few years with satellite estimates of barotropic and baroclinic tidal amplitudes and dissipation, field experiments focused on the generation and propagation of internal tides and regional and global ocean models of the barotropic and baroclinic tides in both the open ocean and coastal ocean. The tides likely

provide a strong control on the stratification and circulation of the ocean, with deep ocean tidal energy dissipation and internal wave production providing approximately 1/3 of the energy for deep ocean mixing. Altimetric observations and global models show the propagation of beams of internal tides over 1000s of kms. This session will provide a forum for both observationalists and modelers to discuss recent results on the generation, propagation and dissipation of tides in both the coastal and deep ocean. Comparisons between global models and regional models and comparisons between models and observations are particularly encouraged as a basis for discussion in this session. (2)

#### 022: Air-Sea Interactions of Typhoons in the Western North Pacific Ocean and Neighboring Seas

*Organizers:* Hans C. Graber, CSTARS-University of Miami, hgraber@rsmas.miami.edu; I.-I. Lin, Dept. of Atmospheric Sciences, National Taiwan University, iilin@as.ntu.edu.tw; Eric D'Asaro, Applied Physics Laboratory, University of Washington, USA, dasaro@apl.washington.edu; David Tweng-Yung Tang, Institute of Oceanography, National Taiwan University, tyt@ntu.edu.tw

Western North Pacific Ocean and the neighboring seas are among the world oceans where tropical cyclones (typhoons) are both ubiquitous and intense. These typhoons impose direct threat to the half-billion people living near the Asian coasts. However, current typhoon intensity forecast skills remain poor and one of the identified major reasons for such discrepancy is the lack of understanding on the complex interactions between ocean and typhoons. For one, a more accurate knowledge of the marine fluxes and energy budgets from measurements inside the boundary layer of typhoons is critical to improving coupled ocean-atmosphere models to better predict storm track and intensity. These complex physical and biogeochemical interactions also include the role of ocean currents and mesoscale ocean eddies in the typhoon's intensification, accurate characterization of air-sea momentum and energy exchanges between cyclone and ocean under extreme typhoon (and super-typhoon) wind conditions, as well as interactions between typhoon, sea state, ocean wave breaking, sea spray, and the ocean. In the summer 2010, a large field campaign (Impact of Typhoon On Pacific, ITOP) comprising aircrafts, research vessels, in-situ ocean observational platforms (buoys, drifters and floats), and satellite observations, was conducted in the western North Pacific ocean to explore the above-mentioned complex issues. This session welcomes submissions from both observational and modeling efforts and is not limited to specific ocean basins. Specifically observations of air-sea interaction from buoys, floats and drifters are of great interest to obtain better estimates of the winds and waves at the air-water interface during typhoon conditions. Submissions under the broad discipline of cyclone-ocean physical and biogeochemical interactions are also very welcomed. (2, 17)

#### 023: Dissolved Organic Matter and the 'Hidden' Carbon Cycle

*Organizers:* Andy Ridgwell, University of Bristol, andy@seao2.org; Dennis Hansell, University of Miami, dhansell@rsmas.miami.edu; Sandra Arndt, University of Bristol, san.arndt@gmail.com; Ellen Druffel, University of California, Irvine, edruffel@uci.edu

There is sufficient dissolved organic matter (DOM) in the modern ocean to put it on par with the atmospheric and terrestrial

vegetation carbon reservoirs. Recent geological interpretations have recognized the potential for changes in the DOM reservoir to drive perturbations of global carbon cycling, with isotopic (and often global warming) events in Earth history being increasingly invoked as consequences of DOM oxidation. If true, one might also question how the DOM reservoir will respond to future global environmental changes. To date, global ocean models have tended to focus on the rapid recycling of the most labile of DOM fractions; the large bulk of more refractory fractions have not been widely considered, yet they must be in play if DOM drives the larger perturbations. Are we underestimating a wider dynamical role for DOM in the ocean with potential for feedback with climate? This session will aim to unmask the nature and role of the ocean DOM cycle, and to this end, we invite submissions addressing any of DOM's hidden facets, including: ocean observations and laboratory characterization; diagenetic, biological, and/or global models; and hypotheses regarding the potential role(s) of DOM in past, present, and future global carbon dynamics and climate. (4, 8, 18)

#### 024: Fecal Pellets of Copepods and Tunicates: Different (Micro) Worlds

*Organizers:* Marion Koester, Ernst-Moritz-Arndt-Universität Greifswald, koesterm@uni-greifswald.de; Gustav-Adolf Paffenhofer, Skidaway Institute of Oceanography, gustav.paffenhofer@skio.usg.edu; Jay Brandes, Skidaway Institute of Oceanography, Jay.brandes@skio.usg.edu

The goal of the session is to provide insight into decomposition processes of fecal pellets of 2 zooplankton taxa, dominating on continental shelves, copepods and tunicates. Their fecal pellets can occur up to thousands per cubic meter (e.g. US Southeastern Shelf), forming a significant contribution to the particulate carbon flux. Pellets are important microworlds: they offer environments for microbial assemblages, catalyze nutrient cycles, function as transport vehicles and food particles. Of recent interest is whether pellets trap harmful substances (oil particles, plastic microparticles) and might serve as inatural microsensors to monitor the health of marine ecosystems. Microbial and chemical processes occurring during early degradation of fecal pellets remain poorly constrained. The decomposition of zooplankton fecal pellets has been described primarily for copepods, while our knowledge of tunicate pellets is limited. Morphological characteristics (composition, stability, digestion status) of pellets of copepods and tunicates differ significantly and are expected to be reflected in their sinking behavior, diversity and function of pellet-associated microbial assemblages, degradation pathways and chemical changes in pellet composition on the scale of hours and days. This interdisciplinary session invites scientists in planktonology, chemistry and microbiology to combine traditional with promising modern methodology towards studying the fate of fecal pellets. (3, 4)

#### 026: Sources, Transformation, and Sinks of Black Carbon in the Ocean

*Organizers:* Rainer Lohmann, University of Rhode Island, lohmann@gso.uri.edu; Carrie Masiello, Rice University, masiello@rice.edu

Black carbon (BC), the carbonaceous aromatic residue of biomass burning and fossil fuel combustion, is a ubiquitous component of global carbon pools due to its refractivity.

Following production, BC travels through soils and the atmosphere and eventually enters the ocean. Although BC has been detected in all marine carbon pools, its roles in marine dissolved and particulate organic carbon are poorly constrained. Major uncertainties include the size of global and regional BC fluxes to the ocean, the significance of marine biodegradation of BC (if any), and BC residence times in the oceans. If biodegradation of BC is minimal in the ocean, BC may serve as a recalcitrant tracer of terrestrial carbon, potentially providing information about ocean dynamics and about the interaction of the terrestrial and marine carbon cycles. On the other hand, in the terrestrial biosphere BC particles alter nutrient cycling, serve as a nucleus for microbial activity, and in watersheds can act as a UV screen. No information yet exists on the continuity or loss of these functions as BC enters the marine system. This session is proposed to convene practitioners from field, laboratory and modeling research to discuss latest findings and highlight on-going research needs. (4, 8, 18)

#### 028: Comparing Physical Processes in Large Lakes and Shallow Inland/Marginal Seas

*Organizers:* Dmitry Beletsky, University of Michigan, beletsky@umich.edu; Chin Wu, University of Wisconsin-Madison, chinwu@engr.wisc.edu; Cary Troy, Purdue University, troy@purdue.edu; Ram Rao, National Water Research Institute, Environment Canada, ram.yerubandi@ec.gc.ca

This session's focus is on comparative analysis of physical limnology and oceanography of large lakes and shallow (less than 1000 m deep) inland and marginal seas. Papers are solicited dealing with modeling, experimental and laboratory studies of physical processes (waves, currents, turbulence, stratification, ice, sediment transport, etc.) in water bodies dynamically similar to large lakes (where Earth rotation effects are important). Examples include large lakes such as Lake Geneva, the Great Lakes, the Caspian Sea, the Baltic Sea, the Sea of Okhotsk, etc. (2, 5, 6)

#### 029: Sediment Transport and Deposition in Lakes, Estuaries, and Shallow Shelves

*Organizers:* Nathan Hawley, Great Lakes Environmental Research Laboratory, nathan.hawley@noaa.gov; Courtney K. Harris, Virginia Institute of Marine Science, ckharris@vims.edu; Lawrence P. Sanford, University of Maryland Center for Environmental Science, lsanford@umces.edu

The physical characteristics of many lakes, estuaries, and shallow shelves - relatively small volumes of water, shallow water depths, relatively long coastlines, and high loadings from rivers and shoreline sources - make them particularly susceptible to environmental degradation. In recent years human population pressures have increased demands on these regions, and in many cases have resulted in an increase in the frequency and severity of problems such as hypoxia, harmful algal blooms, excess turbidity, and high rates of sedimentation. Climate change is expected to add stressors such as increased runoff, storminess, and sea level rise. The importance of sediment transport has become increasingly recognized since not only are many nutrients and anthropogenic pollutants transported by sediments, but sediment-induced turbidity also may limit the amount of light available for photosynthesis and visual predation. Recent advances in theoretical, observational, and numerical modeling have led to increased understanding of sediment dynamics in these complex systems. The session

encourages submissions covering any aspect of sediment transport and depositional processes in lakes, estuaries, and shallow shelves, including field observations, laboratory experiments, and modeling studies. Studies of physical forcing, sedimentary response, different modes of transport, biogeochemical feedbacks with sediments, and particle behavior are all welcomed. (1, 2, 5, 6)

### 030: Gulf of Mexico Circulation & Ecosystem Numerical Modeling

*Organizers:* Christopher N. K. Mooers, Portland State University, [cmooers@cecs.pdx.edu](mailto:cmooers@cecs.pdx.edu); Patrick Hogan, Naval Research Laboratory, [pat.hogan@nrlssc.navy.mil](mailto:pat.hogan@nrlssc.navy.mil); Leo Oey, Princeton University, [lyo@princeton.edu](mailto:lyo@princeton.edu); Claire Paris, RSMAS/University of Miami, [cparis@rsmas.miami.edu](mailto:cparis@rsmas.miami.edu)

The circulation of the Gulf of Mexico is dominated by the Loop Current and the eddies it sheds, and by the passage of intense weather systems in all seasons. The highly variable and intense circulation, together with river discharges, impacts the marine ecosystems of the Gulf. Intensive and extensive field and modeling studies have increased the understanding of the circulation and provide a basis for skill assessing numerical circulation models and prediction systems. Today, more than 20 significant models exist for the Gulf of Mexico circulation. Hence, the Gulf of Mexico has potential to serve as a modeling & observing system testbed for prediction systems. The aim of this session is to explore the skill of some of these models, especially as they apply to ecosystem models. The complex roles of the circulation on dispersion and ecosystem response in the Deepwater Horizon oil & gas gusher event, which began 20 APR 10 and ran for three months, gives new impetus (indeed, urgency) to this topic area. (2, 9, 13, 14)

### 031: Biogeochemical Cycles of Continental Margins: Drivers and Impacts

*Organizers:* Antonio Mannino, NASA Goddard Space Flight Center, [antonio.mannino@nasa.gov](mailto:antonio.mannino@nasa.gov); Cécile Cathalot, Netherlands Institute for Ecology - Centre for Estuarine and Marine Ecology, [C.Cathalot@nioo.knaw.nl](mailto:C.Cathalot@nioo.knaw.nl); Marjorie Friedrichs, Virginia Institute of Marine Science, [marjy@vims.edu](mailto:marjy@vims.edu); Peter Griffith, NASA GSFC, [peter.c.griffith@nasa.gov](mailto:peter.c.griffith@nasa.gov); Antonio Mannino, NASA Goddard Space Flight Center, [antonio.mannino@nasa.gov](mailto:antonio.mannino@nasa.gov)

Biogeochemical cycling in the coastal zone is complex and poorly quantified, both on the mean and in terms of variability in response to a myriad of natural and anthropogenic drivers. Such complexity leads to substantial uncertainty in global and regional carbon budgets. This session focuses on recent progress in understanding coastal biogeochemical cycling, with emphasis on linkages to terrestrial and global ocean cycles. Two areas of research are particularly sought: (1) impacts of climate variability, extreme events (e.g. floods, resuspension), and land-cover/land-use change on the transport and cycling of carbon, nitrogen and other elements to and within the coastal ocean margins; (2) synthesis and modeling work that leads to improved coastal zone carbon budgets at scales of global relevance. This special session invites investigators to present and discuss recent progress in coastal systems biogeochemistry from observational, experimental, and modeling perspectives. (5, 6, 8, 9, 18)

### 032: The Arctic and Subpolar North Atlantic as the Pacesetters for Climate Change

*Organizers:* Igor Yashayaev, Bedford Institute of Oceanography, Canada, [Igor.Yashayaev@dfo-mpo.gc.ca](mailto:Igor.Yashayaev@dfo-mpo.gc.ca); Dan Seidov, NOAA NODC/Ocean Climate Laboratory, USA, [Dan.Seidov@noaa.gov](mailto:Dan.Seidov@noaa.gov); Dagmar Kieke, University of Bremen, Germany, [dkieke@physik.uni-bremen.de](mailto:dkieke@physik.uni-bremen.de); Entcho Demirov, Memorial University of Newfoundland, Canada, [entcho@mun.ca](mailto:entcho@mun.ca)

Arctic and Subarctic oceanic processes are critically important for regulating Earth's climate. As a part of a polar-amplification of climate change the polar areas are warming faster than most other regions of the world. The subpolar North Atlantic acts as a receptor for Arctic-driven climate variability and actively modulates and redistributes climate signals. High-latitude oceanography and climatology are now strongly enhanced by continuing oceanographic monitoring of polar and subpolar basins involving new near real-time in-situ (profiling floats, seagliders) and remote sensing technologies, and by extensive ocean and climate modeling. In conjunction with historic observations and computer simulations these programs have led to important recent advancements in polar and subpolar oceanography and thus in planetary climatology. The session offers an opportunity to discuss new oceanographic data in the Arctic and North Atlantic regions and the ongoing analysis of these data, which in many ways improve our understanding of high-latitude oceanic processes. Of interest to the session are changes in water mass formation, changes in transports and water mass propagation, variability of heat, freshwater and salt content, and changes in their forcing mechanisms. Furthermore, presentations on exchanges between the Arctic and the subpolar North Atlantic and on various aspects of integration of observations and models are highly appreciated. Ocean climate change on decadal, centennial and longer time scale and its impact on regional and global climate is also of great interest to the session. (2, 7, 8)

### 033: Oceanographic Processes at the Antarctic Continental Margins

*Organizers:* Robin Muench, Earth & Space Research Seattle, [rmuench@esr.org](mailto:rmuench@esr.org); Eileen Hofmann, Old Dominion University, [hofmann@ccpo.odu.edu](mailto:hofmann@ccpo.odu.edu); Anna Wahlin, University of Gothenburg, [anna.wahlin@gu.se](mailto:anna.wahlin@gu.se); Laurie Padman, Earth & Space Research Corvallis, [padman@esr.org](mailto:padman@esr.org)

The oceans encircling Antarctica experience vigorous exchanges between ocean, ice and atmosphere, with significant consequences for global ocean and climate states. Water mass modification through cooling, sea ice formation and mixing drives a global deep ocean overturning circulation and impacts the mass balance of the Antarctic Ice Sheet by influencing the stability of ice shelves that buttress glaciers and ice streams. Upwelling at the shelf break provides nutrients that fuel primary production, contributing to a rich ecosystem with a potentially significant impact on the oceanic carbon budget through sequestration. The session will focus on physical and biogeochemical processes in the circum-Antarctic continental margin. Results from field observations, models and remote sensing are welcome. Topics of interest include, but are not limited to: shelf, slope and coastal circulation and mixing; impacts of shelf-slope processes on deep and bottom water formation and on mass balance of ice shelves; atmospheric impacts on physical systems, including the sea ice cover, and

on biological systems; and the relationships between physical processes and regional marine ecosystems. Discussions of the potential impacts of climate change on these various systems are particularly welcome. The session will include both oral and poster presentations. (2, 3, 4, 6, 7, 8, 18)

### 034: Long Waves on Continental Shelves

*Organizers:* Alexander Yankovsky, University of South Carolina, ayankovsky@geol.sc.edu; Andrew Kennedy, University of Notre Dame, andrew.kennedy@nd.edu

Continental shelves cause long wave amplification, act as a waveguide for trapped wave modes, promote energy conversion from barotropic to baroclinic modes, enhance long wave dissipation, and transport energy and momentum far from their generation region. We invite papers which delineate these processes on a wide range of scales including both subinertial and superinertial frequencies. Of particular interest are long waves generated by atmospheric forcing (including extreme forcing events) and tides. Ideally we would like to achieve a combination of theoretical, modeling, laboratory and observational studies. Interdisciplinary studies relating long wave dynamics with biological and geological processes are encouraged. (2, 6)

### 035: Using Data From Autonomous Vehicles and Drifters to Support Education and Outreach

*Organizers:* James A. Yoder, Woods Hole Oceanographic Institution, jyoder@whoi.edu; Janice McDonnell, Rutgers University, mcdonnel@marine.rutgers.edu

Measurements of physical, optical, biological, and biogeochemical ocean properties, as well as high resolution photographic, video and acoustic mapping of bottom features, collected by autonomous vehicles and drifters are now a major source of ocean data supporting research and applications. For example, ARGO drifters are the only in situ global observing system of currents, temperature and salinity; sensors on an autonomous vehicle provided the best measurements of the rate at which oil was escaping from the recent blowout in the Gulf of Mexico and also mapped the deep, subsurface oil plume; a glider recently traversed the Atlantic Ocean; autonomous vehicles are becoming the best way to locate and map bottom features; and drifters are routinely measuring profiles of oxygen and other biogeochemical properties from the Southern Ocean and other remote areas of the global ocean. Not only are autonomous vehicles and drifters providing important and interesting data, the technology is cool and exciting to students of all ages and has the potential to help learners create their own knowledge and understanding of the ocean. Our session looks for contributions from scientists and educators who are working together on education and outreach projects that utilize the data collected from autonomous platforms. Our session goal is to share effective practices and evaluation data around the application of these technologies. (10, 13)

### 036: COSEE: Using Evaluation to Measure the Impacts of Education/Outreach

*Organizers:* Patricia Kwon, COSEE-West, pkwon@aqmd.gov; Andrea Anderson, Soundview Evaluation, andrea@soundviewevaluation.com; Diana Payne, Connecticut Sea Grant, diana.payne@uconn.edu; Shawn Rowe, Oregon State University, shawn.rowe@oregonstate.edu

COSEE (Centers for Ocean Sciences Education Excellence) is an NSF Division of Ocean Sciences program. The COSEE network consists of 14 thematic and regional Centers across the U.S. and its mission is engaging scientists and educators to transform ocean sciences education. One of the unique aspects of the COSEE program is that each Center has its own evaluator—a person or team continually assessing the effectiveness and impact of education strategies and activities. This session will discuss what has been learned since the beginning of the COSEE program in 2002. During this session COSEE evaluators and scientists will present the results of a variety of studies on COSEE audiences, scientist-educator collaborations, and broader impacts and education/outreach activities. From ocean observing systems to concept mapping to models, we will showcase what we've learned since the beginning of the COSEE program in 2002 and discuss the implications for future COSEE education strategies and evaluation efforts. (10)

### 037: Operational Applications of Ocean Satellite Observations

*Organizers:* Margaret Srinivasan, Caltech Jet Propulsion Laboratory, margaret.srinivasan@jpl.nasa.gov; Dr. Robert Leben, University of Colorado, Colorado Center for Astrodynamics Research, leben@colorado.edu

We invite contributions on operational applications utilizing both near real-time (NRT) and reconstructed historical ocean satellite data, in addition to ocean reanalysis and coupled models of relevant parameters. Of particular interest are studies and methods that highlight the practical uses of altimetry, scatterometry, ocean color, ocean temperature, salinity and gravity data with real-world or potential commercial applications. The combination of data between two or more sensors, or between multiple satellites producing same sensor data, can be a powerful tool in analyzing ocean circulation and climate effects, can contribute to operational optimizations, and can even have significant contributions to issues of safety at sea. Operational applications may include, but are not limited to, offshore oil and other marine operations, NRT data streams, NRT coastal monitoring, operational processing, blended satellite data for operational use, marine mammal studies, fisheries management, recreational boating, and climate/hurricane studies. We strongly encourage topics in marine forecasting and those with potential industry or commercial applications. (2, 12, 13)

### 038: Changing Biogeochemistry and Ecosystems in the Western North Pacific Continental Margins Under Climate Change and Anthropogenic Forcing

*Organizers:* Kon-Kee Liu, National Central University, kkliau@ncu.edu.tw; Minhan Dai, Xiamen University, mdai@xmu.edu.cn; Gwo-Ching Gong, National Taiwan Ocean University, gcgong@ntou.edu.tw; Chih-Hau Hsieh, National Taiwan University, chsieh@ntu.edu.tw; Hiroaki Saito, Fisheries Research Agency, hsaito@affrc.go.jp

Continental margins in the western north Pacific are bordered by the world's most densely populated coastal communities and receive runoff from very large rivers. The large anthropogenic pressure threatens diverse coastal marine ecosystems, as demonstrated by the four-fold increase of Changjiang nitrogen loading in the past 30 years that possibly contributes to the increasing hypoxia in the East China Sea. On the other hand, increasing impounding of freshwater for irrigation purposes

may reduce riverine load of dissolved silicate, altering discharge patterns, nutrient elemental ratios and phytoplankton community downstream. Increasing frequencies of widespread flooding since the beginning of the 20th century, which is attributable to the accelerated global hydrological cycle, may also cause marked changes in coastal oceans. As continental margins sustain arguably the most productive ecosystems and most active biogeochemical processes in the earth system, the stressed ecosystems may threaten the livelihood of a large human population. Moreover, the altered biogeochemical cycles may cause many unknown feedbacks that exacerbate effects of climate change. We invite contributions on interactions between physical-biogeochemical processes and the ecosystem in the west Pacific and consequences of human perturbations on these systems, as revealed by field observations, remote sensing, or modeling studies. (6, 8, 9, 18)

### 039: Ocean Biogeochemistry Time-Series and Climate

*Organizers:* Frank Muller-Karger, University of South Florida, carib@marine.usf.edu; Matthew Church, University of Hawaii at Manoa, mjchurch@hawaii.edu; Michael Lomas, Bermuda Institute for Ocean Sciences, michael.lomas@bios.edu; Gordon Taylor, Stony Brook University, gtaylor@notes.cc.sunysb.edu

Much of our understanding of temporal variability associated with ocean biogeochemistry derives from sustained, systematic, shipboard time-series observations. Time-series science programs provide the oceanographic community with multi-year, high-quality data needed for characterizing ocean climate, biogeochemistry, and ecosystem variability. We invite contributions from studies which use ocean carbon and biogeochemistry time-series data, and especially encourage studies that examine time-series observations and datasets to elucidate changes in ocean biogeochemical processes, ecosystem structure and function, and linkages and feedbacks with the Earth's climate system. (3, 4, 8, 18)

### 040: Biogeochemistry of DOM in the Arctic Ocean

*Organizers:* C line Gu guen, Trent University, celinegueguen@trentu.ca; Mats Garnskog, Norwegian Polar Institute, mats.granskog@npolar.no; Colin A. Stedmon, Aarhus University, cst@dmu.dk

The major sources of dissolved organic matter (DOM) to the Arctic Ocean are riverine input, inflow from the Atlantic and Pacific Oceans and autochthonous production in surface waters and shelf seas. Rapid climate change in the region is currently shifting the balance of these sources. As they each supply DOM with different chemical characteristics we can expect that the turnover and fate of this material will also change. Shifts in the bioavailability will influence the role that DOM plays in Arctic marine ecology and biogeochemistry. Increased supply of colored DOM (CDOM) will affect photochemistry, underwater light penetration and quality, and heat absorption. Studying the nature, distribution and source dependency of the persistent refractory fraction of DOM offers an additional tool to assess current and future circulation patterns. This session invites contributions on any of these aspects of Arctic DOM biogeochemistry. (4, 7, 18)

### 041: Methods and Applications of Data Assimilation for Ocean Biogeochemistry

*Organizers:* Katja Fennel, Dalhousie University, katja.fennel@dal.ca; Micheal Dowd, Dalhousie University, mdowd@mathstat.dal.ca; Richard Matear, CSIRO, Richard.Matear@csiro.au; Katja Fennel, Dalhousie University, katja.fennel@dal.ca

The quantity and diversity of data available for monitoring ocean biogeochemical variables is rapidly increasing as new sensor technologies and observational platforms are deployed. A major challenge is the development of new analysis methods for these complex spatio-temporal data types that yield information not just about the ocean state, but also the underlying dynamical processes. Model-data fusion (or Data Assimilation) algorithms provide an attractive approach to exploit these new data streams within a robust statistical framework. This session invites contributions on biogeochemical data assimilation methods and applications that characterize the biogeochemical state; provide new ways to determine biogeochemical parameters; elucidate the processes driving biogeochemical variability and changes in the ocean; or provide guidance to observing strategies for biogeochemical fields. (4, 13, 16, 18)

### 042: Eddy Correlation and New Impending Approaches for Measuring Fluxes in the Aquatic Environment

*Organizers:* Peter Berg, University of Virginia, pb8n@virginia.edu; Markus Huettel, Florida State University, mhuettel@fsu.edu

Eddy correlation is becoming a commonly-used approach for measuring oxygen exchange between benthic communities and the overlying water. The technique allows direct measurements of this flux, and can be used where other traditional methods would fail, e.g. densely-vegetated sediments, highly permeable sands and gravel beds, and hard surfaces such coral reefs and mussel beds. Eddy correlation measurements are done under true in situ conditions with minimal disturbances of the natural light and hydrodynamic conditions, and incorporate a much larger bottom area than traditional flux methods. Other new approaches for measuring benthic fluxes with similar advantages are currently being presented including the flux ratio approach, where fluxes are derived from vertical concentration gradients and eddy diffusivities in the bottom water. In this session, we invite users of the eddy correlation technique and other new flux methods to present their results and experiences. We stress that this session is not only focused on benthic oxygen fluxes, but on all scalar fluxes in the aquatic environment. We also encourage contributions introducing new methods for flux measurements in aquatic environments that are still under development. (2, 4, 13)

### 044: Advancing Satellite Ocean Color Science for Global and Coastal Research

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Ocean color satellites provide daily global synoptic views of marine optical and biogeochemical properties. These properties describe the contents of the upper ocean mixed

layer, information critical to furthering scientific understanding of ocean processes such as carbon exchanges, phytoplankton dynamics, and responses to climatic disturbances. The international community has invested significant effort in improving the quality and maintaining the continuity of satellite-derived marine optical properties, and in developing innovative approaches to study marine biogeochemical processes in both coastal and open ocean environments. In 2012, the continuous record of satellite ocean color enters its 16th year, with multiple ocean color sensors from several space agencies contributing to the time-series and a host of international research institutions contributing algorithms and field measurements. This session aims to take stock of a fast-evolving field through presentations addressing the state-of-the-art in advanced ocean color products, methods, and research applications that enhance our understanding of marine ecosystems and regional to global carbon cycle dynamics. (3, 12)

#### 045: Oceanic Oxygen Content: Observed Physical and Chemical Processes and Climate Related Changes in the Past, Present and Future

*Organizers:* Lothar Stramma, IFM-GEOMAR, lstramma@ifm-geomar.de; Sabine Mecking, University of Washington, smecking@apl.washington.edu; Denis Gilbert, Institut Maurice-Lamontagne, Denis.Gilbert@dfo-mpo.gc.ca; Ralph Keeling, Scripps Institution of Oceanography, rkeeling@ucsd.edu

In the past few years, changes in dissolved oxygen content have become a focal point of oceanic research, due to their large impacts on ecosystems, water column chemistry and sedimentary feedbacks. In the open ocean, the oxygen content appears to be decreasing in most (but not all) areas, especially in the oxygen minimum zones. At the same time, low oxygen areas have spread in the coastal oceans during recent decades. The understanding of physical processes, such as advective oxygen supply or vertical mixing, and chemical processes, such as the interaction between critical oxygen levels and nutrient cycling that cause or are impacted by the observed oxygen changes is limited. The focus of this session is to enhance the understanding of the physical and chemical processes controlling the ocean's oxygen content, the changes in oxygen and their link to climate trends, atmospheric oxygen variations and decadal variability in ocean ventilation, the expansion of oceanic oxygen minimum zones, and the interaction between the open ocean and the shelf. Submissions of abstracts on observations e.g. from the WOCE, CLIVAR or Argo measurement programs or from time series stations as well as on model results illustrating past, present and future oxygen changes are welcomed. (2, 4, 8)

#### 046: Understanding the Biological Consequences of Ocean Acidification in a Holistic Global Change Context

*Organizers:* David Hutchins, University of Southern California, dahutch@usc.edu; Philip Boyd, University of Otago, New Zealand, Pboyd@chemistry.otago.ac.nz; Shannon Meseck, National Marine Fisheries Service, smeseck@clam.mi.nmfs.gov; Adina Paytan, University of California Santa Cruz, apaytan@ucsc.edu

Ocean acidification is happening in concert with a complex matrix of other ocean global change variables, including sea surface warming, stratification and mixed-layer shoaling, altered irradiance regimes, changes in major and micronutrient supplies, sea-ice retreat, increased hypoxia, and consequent

novel trophic and competitive interactions due to biogeography shifts. Each of these factors individually will have impacts on the structure and function of biological communities, but the interactions between them may often be more influential on the physiology and ecology of marine organisms than the effect(s) of any one variable alone. Ocean acidification and other global change variables can sometimes interact in highly nonlinear ways, including both synergistically and antagonistically. We therefore encourage presentations featuring experimental, observational, and/or modeling work on the biological consequences of these types of multivariate environmental stressors. Research findings that offer insights into the ability of marine organisms to acclimatize or adapt to long-term changes in multiple environmental stressors are particularly welcome. This session is intended to foster a holistic consideration of biological ocean acidification impacts in the context of complex ecosystem changes, including the capacity for organisms to respond to simultaneous shifts in multiple environmental factors through either phenotypic plasticity or evolution. (3, 4, 8)

#### 047: Integrative Power of Ocean Observatories: Recent Insights and Future Directions

*Organizers:* Steven G. Ackleson, Consortium for Ocean Leadership, sackleson@oceanleadership.org; Steven G. Ackleson, Consortium for Ocean Leadership, sackleson@oceanleadership.org; Mairi Best, NEPTUNE Canada, mmmrbest@uvic.ca; Emmanuel Boss, University of Maine, emmanuel.boss@maine.edu; Richard Dewey, VENUS, Ocean Networks Canada, rdewey@uvic.ca

Ocean observing system technology (sensors, platforms, communications, and data management) has advanced significantly in recent years, integrating complex hardware, software, and people networks and employing fixed, drifting, and mobile components. These advances have provided ocean and earth scientists with springboards for new and novel research enabled by increasingly interactive access to persistent, real-time, high-frequency, multi-disciplinary data representing even the most extreme environmental conditions from the coast to the deep sea. Combined with traditional ship-based and remote sensing observations, ocean observatories have yielded new knowledge across a broad scope of earth-ocean scales including global and regional circulation, ecosystem and carbon dynamics, air-sea interaction, ocean acidification, and ocean floor substrate-fluid processes. This session offers a forum to highlight discoveries and insights that have emerged during the past decade of ocean observatory data, examine recent scientific findings and discuss future research needs and challenges. Oral presentations of data analyses that advance knowledge of interdisciplinary oceanographic processes are encouraged. Poster presentations that discuss infrastructure, ongoing observatory operations and planned observing activities are also encouraged. (12,13)

#### 048: Ocean Surface Boundary Layers

*Organizers:* Baylor Fox-Kemper, University of Colorado, bfk@colorado.edu; Stephen Belcher, University of Reading, s.e.belcher@reading.ac.uk; Eric D'Asaro, University of Washington, dasaro@apl.washington.edu; Alberto C. Naveira Garabato, National Oceanography Centre, Southampton, acng@noc.soton.ac.uk

The upper ocean is a turbulent environment with control over the air-sea exchange of momentum and gasses. This session will

include observations, modeling, theory, and parameterizations of near-surface processes. Primary topics of interest include: Generation of turbulence through surface wave interactions and dissipation; turbulence scaling in models and observations; remote and in situ observation; wave process simulations; submesoscale phenomena in the surface layer; roles of the surface layer in the larger climate system; and wave-wind-mixing-current interactions. (2, 17)

#### 049: Advances in the Oceanography of Trace Elements and Isotopes in the Atlantic and Polar Oceans

*Organizers:* Micha Rijkenberg, Royal Netherlands Institute for Sea Research, Micha.Rijkenberg@nioz.nl; Rob Middag, University of California Santa Cruz, Rob.Middag@nioz.nl; Stephanie Owens, Woods Hole Oceanographic Institution, sowens@whoi.edu; Patricia C-mara Mor, Universidad Autonoma de Barcelona, Patricia.Camara@uab.cat

The dynamic hydrography of Atlantic, Arctic and Antarctic Oceans is key to the distribution of trace elements in the global oceans. Trace elements like iron play a pivotal role in controlling ocean productivity and therefore global climate. Moreover, several Trace Elements and Isotopes (TEIs; stable or radioactive; natural or anthropogenic) serve as important tracers for unraveling ocean processes and turnover rates. Novel ultraclean rapid sampling systems and international reference samples facilitate measurement of TEIs along deep ocean sections in unprecedented high spatial resolution, coverage and accuracy. For example, the international effort resulted in the thus far longest 13000 kilometer full depth ocean section of TEIs in the Atlantic basin. Intercalibration at crossover stations further confirms accuracy between cruises. The high resolution and multi-tracer approaches produces novel relationships among TEIs and other tracers, and reveals details not seen before. This in turn leads to shifts of paradigms. For example, hydrothermal supply of iron and manganese appears more important for ocean inventory budgets than previously realized. For this session we like to invite topics on TEIs in the Atlantic and polar oceans, including methods, intercalibration, field data and ocean modeling. Relevant topics in other oceans are most welcome as well. (4)

#### 050: Linking the Optical and Chemical Properties of Dissolved Organic Matter in Natural Waters

*Organizers:* Christopher Osburn, North Carolina State University, closburn@ncsu.edu; Colin Stedmon, Department of Marine Ecology, National Environmental Research Institute, University of Aarhus, cst@dmu.dk; Robert G.M. Spencer, Woods Hole Research Center, rspencer@whrc.org

A paradigm in chemical oceanography is the remarkable similarity in the optical and chemical properties of both marine dissolved organic matter (DOM) and substantially degraded riverine DOM. Recently, in the oceanographic literature, a number of articles have reported on using combined optical and chemical techniques to investigate the sources and cycling of DOM in the coastal and open ocean water columns and in sedimentary pore waters. However, studies that calibrate the optical properties of DOM with geochemical measurements are few and far between in the literature. In addition, studies that attempt to resolve these properties with respect to rates of riverine DOM photochemical and biological degradation are also lacking. This session will provide a forum for scientists to

exchange ideas and demonstrate progress in linking data-rich spectroscopic techniques, such as excitation-emission matrix fluorescence (EEMs) and spectral absorption, to geochemical measurements of DOM, such as elemental ratios, nutrients, stable isotopes, biomarkers, and structural characterizations arising from new developments in analytical techniques such as mass spectrometry and nuclear magnetic resonance spectroscopy. (4, 6, 12)

#### 051: Compatible Analytic, Mathematical and Laboratory Modeling of Basic Oceanic Processes

*Organizers:* Yuli D. Chashechkin, Institute for Problems of Mechanics of the RAS, Moscow, chakin@ipmnet.ru; Iaroslav V. Zagumennyi, Institute of Hydromechanics NASU, Kiev, zagumennyi@gmail.com; Victor E. Prohorov, Institute for Problems of Mechanics of the RAS, Moscow, Prohorov@ipmnet.ru

This session is concerned with the nonlinear dynamics different waves, vortices, vortex systems, jets and wakes as component of oceanic processes. Manifestation of rotation, stratification and dissipation effects is subject of discussions and applications to the Earth's ocean and atmosphere dynamics. Waves, vortices, jets and turbulent patches can be considered as coherent structures existing individually or in combination with each others. Mechanisms of their formation, propagation and decay, the parameterization of these processes are among the discussed themes. Topics that will be dealt with are the nonlinear dynamics of thin interfaces, fronts, coherent structures; their mutual interactions and interaction with waves are also welcome. Condition of observability of physical quantities in different models and accuracy of oceanic measurements are point of discussion too. Among discussed are problems of modeling results extrapolation on the environment. Presentations including data of field and laboratory studies, numerical and analytical modeling of phenomena of all scales from the finest ones defined by dissipation to global values are welcome. (2)

#### 053: Nitrogen and Carbon Cycling in the Eastern Tropical Pacific Ocean: Linking the OMZ To the Open Ocean

*Organizers:* Angela Knapp, RSMAS/University of Miami, aknapp@rsmas.miami.edu; Alyson Santoro, UMCES-Horn Point, asantoro@whoi.edu; Rachel Foster, MPI Bremen, rfoster@mpi-bremen.de; Sophie Bonnet, IRD, France, Sophie.Bonnet@univmed.fr

The N budget for the global ocean remains poorly constrained, with some reports suggesting that sinks exceed sources. Moreover, the disparate geographical distribution of field efforts examining N removal from the ocean (primarily via denitrification) and N additions (primarily via N<sub>2</sub> fixation) implied that they were spatially separated. The Eastern Tropical Pacific (ETP) Ocean provides a testbed for the recently proposed tight coupling between N inputs and losses, as well as testing linkages between the carbon and nitrogen cycles. Several major US and European-sponsored cruises have recently completed field work in these regions characterized by intense oxygen minimum zones, and novel measurements have been made including: molecular investigations of N-related gene sequences, rate determinations of N and C cycling, bottle incubations with nutrient and metal additions, N isotope analyses of common and rare N species, C and N fluxes from the surface ocean as

captured by shallow and deep sediment traps, and other novel export estimates. This session welcomes contributions related to the N and/or C cycles observed in either the northern or southern ETP. (3, 4, 18)

#### 054: Mapping and Characterizing the Seafloor Using Acoustics: Bringing Spatial Data Up from the Depths

*Organizers:* Miles G. Logsdon, University of Washington, School of Oceanography, mlog@u.washington.edu; Leslie R. Sautter, College of Charleston, Dept. of Geology and Env. Geosciences, sautterl@cofc.edu

Advances in acoustic techniques along with increased availability of high resolution bathymetric data have resulted in significant contributions by academia, government and industry toward better documentation and understanding of the ocean's floor. The techniques and technologies associated with bathymetric mapping, ground-truthing, habitat characterization, seafloor morphology, and geospatial pattern analysis now enable exploration and experimentation of ocean processes at spatial and temporal resolutions never before possible. With opportunities such as these, comes the responsibility to understand error and precision as well as provide explanation regarding the legacy of the data. Beginning with survey design through the visualization and quantitative assessment of form, mapping and characterization of the seafloor using acoustics requires attention to numerous processes which may influence the use of resulting data. This poster session will showcase studies that utilize multibeam and sidescan sonar along with other acoustic techniques that characterize shallow and deep water settings, as well as work which reviews current research in the acquisition, processing and application of the data. (1, 12)

#### 056: Benthic Processes in a High CO<sub>2</sub> World

*Organizers:* Alexandra Rao, Vrije Universiteit Brussel, a.rao@nioo.knaw.nl; Christian Wild, Leibniz Center for Tropical Marine Ecology (ZMT), christian.wild@zmt-bremen.de; Matthew Charette, Woods Hole Oceanographic Institution, mcharette@whoi.edu

Recent research has demonstrated that the release of fossil fuel CO<sub>2</sub> to the atmosphere leads to ocean acidification, which is predicted to have a strong adverse effect on marine ecosystems. At the same time, our perceptions of the benthic boundary layer continue to evolve, encompassing a complex interplay of physical, chemical and biological processes in sediments. The links between sediments and ocean acidification are not unidirectional, and the emerging model suggests that numerous feedbacks may impact future changes in ocean chemistry and benthic ecosystems on multiple time scales. Key players include (i) biological communities, from coral reefs to microorganisms and macrofauna in deep and shallow sediments, whose activities have wide-ranging implications for benthic ecology, elemental cycling, and commercial fisheries, (ii) transport and reaction in deep sea and continental margin sediments, including the impact of tides, waves, and bottom currents in permeable sands, and (iii) submarine groundwater discharge, carbonate and pH dynamics in subterranean estuaries. This session aims to bring together experts in measurements and modeling of ocean acidification and benthic processes to address methodological and conceptual challenges pertaining to studies at the frontier between these disciplines. We encourage multi-disciplinary contributions. (3, 4, 6, 8)

#### 057: Biogeochemical Cycling of Micronutrient Trace Elements

*Organizers:* Maeve Lohan, University of Plymouth, maeve.lohan@plymouth.ac.uk; Andrew Bowie, Antarctic Climate & Ecosystems CRC, Andrew.Bowie@utas.edu.au; Toshi Gamo, University of Toyko, gamo@aori.u-toyko.ac.jp; Greg Cutter, Old Dominion University, gcutter@odu.edu

There is growing international interest (e.g., GEOTRACES, SOLAS, IMBER) to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes in the ocean and to establish the sensitivity of these distributions to changing environmental conditions. This session will focus on the trace elements that serve as micronutrients (e.g., Fe, Cu, Co, Zn, etc), the availability of which influence the biogeochemical activity of marine organisms, control the structure of ocean ecosystems and hence regulate the ocean carbon cycle. We also welcome presentation of data on diagnostic trace elements (e.g., Al, Mn, rare earths, etc) and isotopes that help characterise micronutrient sources and sinks. Submissions are invited which focus on micronutrients and diagnostic tracers in different phases (dissolved, particulate, speciation) that have been studied both along ocean sections from different ocean basins and in the context of process studies. We also welcome abstracts focusing on the numerical modeling of micronutrients to quantify lateral and vertical transports, as well as biogeochemical sources and sinks. (4, 18)

#### 058: Integrated Observational and Modeling Studies of Marine Ecosystems

*Organizers:* Bradley Penta, Naval Research Laboratory - Stennis Space Center, penta@nrlssc.navy.mil; Francisco Chavez, Monterey Bay Aquarium Research Institute, chfr@mbari.org

New and emerging technologies are allowing unprecedentedly comprehensive views of marine ecosystems. Observations by shipboard, towed, fixed, remote, and autonomous platforms equipped with complementary sensors and informed by simulation models are providing new insights into fundamental ecosystem processes. This session will focus on multi-disciplinary, multi-platform process and modeling studies of plankton blooms in marine ecosystems. Presentations are solicited that highlight results from interdisciplinary studies (e.g., BloomEx, BIOSPACE, AOSN, COAST, MUSE, NAB) and recent advances in observational, data processing, and modeling techniques. Contributions are welcome on the subjects of coordination and control of observational assets, adaptive sampling, and mission planning (decision support). Submissions on modeling and data assimilation methods are also within the scope of this session. (3, 9, 13, 16)

#### 059: Ocean Climate Data Records

*Organizers:* Kenneth S. Casey, NOAA National Oceanographic Data Center, kenneth.casey@noaa.gov; Edward Kearns, NOAA National Climatic Data Center, Ed.Kearns@noaa.gov; Craig Donlon, European Space Agency, craig.donlon@esa.int

The National Research Council (2004) defines a Climate Data Record (CDR) as a time series of sufficient duration, quality, and continuity to accurately determine climate variability and change. For satellite-based CDRs, GCOS provides requirements in the form of essential climate variables (ECV) that share several characteristics including being long-term, consistently processed, highly accurate, and produced with

associated uncertainties using systems that combine sustained, ongoing capacity with the latest community consensus science knowledge and best practices. Both satellite and in situ-based CDRs support a wide range of applications including climate change monitoring and numerical prediction, coral bleaching and disease, the oceans and human disease outbreaks, ocean circulation, and sea level change. Educational and operational applications involving interpretation of real-time information are also enabled and improved by the climatological context provided by CDRs. Presentations are welcomed that describe methods for Fundamental CDR production; the development and production of Thematic CDRs; the status of existing CDRs for the ocean and overlying atmosphere; the integration of CDRs into ocean and climate modeling activities; the challenges associated with determining CDR uncertainties; and results from the analyses of CDRs. The CDRs may be those derived from in situ, remotely-sensed, or a combination of methods, and include those related to any oceanographic discipline. (8, 16)

### 060: Marine Gas Hydrate Deposits: Research, Monitoring Strategies and Present-Day Knowledge

*Organizers:* Ray Highsmith, University of Mississippi, ray@olemiss.edu; Laura Lapham, Aarhus University, laura.lapham@biology.au.dk; Leonardo Macelloni, University of Mississippi, lmacello@olemiss.edu; Marta Torres, Oregon State University, mtorres@coas.oregonstate.edu

Gas hydrates are the largest reservoir of methane on Earth. Hydrate stability is influenced by temperature and pressure fluctuations. Several deposits have been identified world-wide near the seafloor surface and represent a unique system where stability might be affected also by microbial interactions, very low seismic activity and oceanographic fluctuations (storms, currents, tides). Methane reaching the seafloor from deep reservoirs becomes an important source of carbon for diverse communities of microbes and macrofauna, making these areas ecologically important. The near-surface hydrate sites also sequester large amounts of carbon within associated carbonate deposits, which provide habitat for benthic communities. Therefore, to understand the factors that control hydrate stability or interactions with the surrounding ocean, it is critical to monitor and study the deposits over time. We seek abstracts highlighting recent results on the evolution of geological, biological, or chemical factors based at established research/monitoring stations, such as in the Gulf of Mexico or the Cascadia Margin, or at hydrate sites around the world that have been visited frequently over time. What have we learned about hydrate deposits? How dynamic are they and what are the controlling factors? What is needed for future hydrate research and monitoring? (1, 3, 4, 18)

### 061: Coastal Oceanography through Integrated Data Analysis

*Organizers:* Yonggang Liu, University of South Florida, yliu@marine.usf.edu; Ryan M. McCabe, University of Washington, rmcabbe@ocean.washington.edu

With increasing coastal ocean observation systems and independent projects collecting various data streams, our understanding of continental shelf processes has advanced significantly in recent years. This special session is an opportunity to showcase new scientific results obtained from these sustained or process-oriented coastal observations

including, for example, moored current meters, HF radars, AUVs, gliders, drifters, profilers, tide gauges, C-MAN stations, satellites, and other remotely-sensed data. Progress on a variety of coastal topics such as along- and cross-shelf circulation and exchange, upwelling and downwelling dynamics, buoyancy fluxes, local and remote forcing, estuary-plume-shelf systems, offshore current/eddy intrusions, topographic influences, and their downstream impacts are all encouraged. Noting that no single instrument is enough to fully capture dynamic coastal ocean processes, new insights from integrated data analyses covering multiple scales by combing two or more types of data are particularly encouraged. Numerical model-assisted data analyses and accompanying insights are also welcome. (2, 6, 13)

### 063: Ocean Exploration

*Organizers:* Nicolas Alvarado, NOAA Office of Ocean Exploration & Research, nicolas.alvarado@noaa.gov; Reginald Beach, NOAA Office of Ocean Exploration & Research, Reginald.Beach@noaa.gov

With 95% of the ocean unknown or little known, ocean exploration is an emerging (or re-emerging) discipline in oceanography that is interdisciplinary and global in scope. Data and observations resulting from ocean exploration activities often result in new discoveries, new insight, new knowledge and new frontiers and can lead to the revision of existing paradigms or the formulation of new paradigms in the oceans poorly known and unknown regions. This session will highlight the technology, science and expeditions that explore ocean, coastal and Great Lakes environments. Results can be from any branch of marine science or technology and may include serendipitous observations from any platform, including, but not limited to, unmanned systems, animal-borne-sensors, moorings, fixed platforms, research cruises, remote sensing or designated exploration activities. (13, 15)

### 064: Oceanography in 2030

*Organizers:* Peter Cornillon, University of Rhode Island, pcornillon@me.com; Peter Cornillon, University of Rhode Island, pcornillon@me.com; Mark Abbott, Oregon State University, mark@coas.oregonstate.edu

New and evolving technologies will have a dramatic impact on all aspects of our lives over the next 20 years. This session will explore the likely technological advances relevant to oceanography in the 10 to 20 year timeframe and the anticipated impacts of these advances on the oceanography that will be undertaken. It will also examine the impact of technology as well as other pressures on the institutional infrastructure of oceanography itself. Specifically, what will oceanography the science and oceanography the discipline look like in 2030? (11, 13)

### 065: Physical-Ecological Interactions in Inland Waters

*Organizers:* Alfred Wuest, EAWAG, alfred.wueest@eawag.ch; Josef Daniel Ackerman, University of Guelph, ackerman@uoguelph.ca; Miki Hondzo, SAFL at UMN, mhondzo@umn.edu

Anthropogenic impacts through natural resources use and climate change place increasing stress on inland waters. Significant among these changes are those related to the physical environment and the consequences for the biogeochemistry and ecology of aquatic environments. This session will address physical, biogeochemical and/or ecological interactions at a variety of spatial and temporal scales in the pelagos and benthos

of coastal and inland waters. It will focus on defining relevant spatial and temporal scales, developing relationships, and predicting the impacts of anthropogenic activities on aquatic ecosystems. (2, 3, 4, 5, 18)

### 066: Western Pacific Ocean Circulation and Air-Sea Interactions

*Organizers:* Fan Wang, Insitute of Oceanology, Chinese Academy of Sciences, fwang@qdio.ac.cn; Kentaro Ando, Japan Agency for Marine-Earth Science and Technology, andouk@jamstec.go.jp; Dongchull Jeon, Korea Ocean Research and Development Institute, dcjeon@kordi.re.kr; Janet Sprintall, Scripps Institution of Oceanography, jsprintall@ucsd.edu; Sophie Cravatte, LEGOS/IRD, Toulouse, sophie.cravatte@ird.fr

The western Pacific (WP) features a complicated ocean circulation system with intensive multi-scale air-sea interactions. As the origin or fate of several major currents, the WP strongly interacts with the ambient oceans and marginal seas, and participates in the recharge-discharge process of the western Pacific warm pool. The changes in the WP can highly influence the heat and freshwater budget and hence the atmospheric deep convection over the warm pool, thereby playing a key role in modulating ENSO cycles and the East Asian Monsoon, as well as in the development and evolution of the tropical cyclones. This session seeks contributions with topics including the WP circulation and its variability of both hemispheres, interactions with the mid-latitudes and maritime continents, and roles in the warm pool maintenance and variability, interactions between western boundary currents, equatorial currents and mesoscale processes, upper ocean processes, barrier layer and salt budget of the warm pool, and air-sea interactions associated with the warm pool, the ITCZ and the SPCZ, etc. This session would like to promote a forum for coordinating on-going and planned observational and modeling efforts relating to climate variations in the western tropical Pacific Ocean. (2, 17)

### 067: Altered Estuaries: Processes, Restoration, and Management

*Organizers:* Guan-hong Lee, Inha University, ghlee@inha.ac.kr; Guan-hong Lee, Inha University, ghlee@inha.ac.kr; Aswani K. Volety, Florida Gulf Coast University, avolety@fgcu.edu; Timothy M. Dellapenna, Texas A&M University, dellapet@tamug.edu

Estuaries provide valuable ecological services such as nursery habitat for recreationally and commercially important fin and shell fisheries; feeding grounds for birds, recreational needs of humans, and filtration and treatment of numerous chemical and microbiological contaminants, etc. At the same time, estuaries lie within the watersheds of the most heavily populated areas with about 60% of the world population living along estuaries and coasts. Over the last century estuaries have been altered by various human activities, including sedimentation from soil erosion; overgrazing and other poor farming practices; drainage and filling of wetlands; eutrophication due to excessive nutrients; and diking or damming for flood control or water diversion; Efforts have been made in recent decades to understand the nature of altered estuaries and the natural response to these modifications, with the intention of restoration and/or best management practices of estuaries. This session will provide a venue to share our increased knowledge of the comprehensive nature of physical, chemical, geological and biological processes of altered estuaries, as well as our experience on their restoration

and adaptive management practices. Our knowledge will help to establish operational tools for environmental management of altered estuaries in supporting a policy of global management of the estuaries. (5, 9, 11)

### 068: Air-Sea Interactions in Western Boundary Current Systems and Marginal Seas

*Organizers:* Hisashi Nakamura, RCAST, University of Tokyo, hisashi@atmos.rcast.u-tokyo.ac.jp; Hisashi Nakamura, University of Tokyo, hisashi@atmos.rcast.u-tokyo.ac.jp; Meghan F. Cronin, NOAA PMEL, Meghan.F.Cronin@noaa.gov; Shoshiro Minobe, Hokkaido University, minobe@mail.sci.hokudai.ac.jp; Shang-Ping Xie, University of Hawaii, xie@hawaii.edu

This session focuses on extratropical air-sea interactions in western boundary current (WBC) systems and marginal seas, where huge amounts of heat and moisture are supplied from the ocean to the atmosphere. Particular emphasis is placed on atmospheric and oceanic processes, occurring over a wide range of spatial and temporal scales, that are involved in the air-sea interactions within those hot spots and that may play a role in the climate system and its variability. Contributions based on observational, diagnostic, modeling and theoretical studies are invited on a range of topics including, but not limited to, the processes affecting the oceanic fronts and distribution of heat within the WBC systems and marginal seas, the influence of WBCs and associated oceanic frontal zones on wind distribution, cloud formation, organization of precipitation systems, cyclone development, the formation of storm tracks and jet streams, their variability and modulations on interannual and decadal scales, and their feedbacks/influences on ocean currents/jets and their interactions with meso-scale eddies, mode water formation, and marine ecosystems. Contributions on air-sea interactions over marginal seas are also invited, including strong seasonality, bathymetric effects, sea-ice formation, and continental influences through atmospheric processes and river discharge, and interactions with open oceans. (2, 17)

### 069: Processes, Preservation, and Potential of High-Resolution Paleoclimate Signals in Marginal Basins

*Organizers:* Gert J. De Lange, University of Utrecht, gdelange@geo.uu.nl; Francisca Martinez-Ruiz, CSIC-University of Granada, fmruiz@ugr.es; Stefano Bernasconi, ETH Zurich, stefano.bernasconi@erdw.ethz.ch

High-resolution climate records that are continuous and with sufficient time resolution are needed to detect high-frequency variations in paleo-climate. Such records are rare but vital for our understanding of causes and consequences of climate and environmental change at decadal to millennial time scales. In contrast to most deep basin pelagic sediments, near-coastal high sedimentation rate sediments or marginal basins with restricted circulation appear to have great potential for recording and preserving high resolution paleoclimate signals of Global importance. Examples of such basins are Cariaco trench, Californian borderland basins, Mediterranean, Black Sea, Baltic, fjords. In this session we welcome contributions on high resolution climate records that form the basis for the discussion on anthropogenic versus natural factors for short term climate variations in sub-recent and past. In addition, we welcome contributions that discuss processes that lead to preserved paleoclimate records, including residence time, productivity versus preservation, land-, and atmosphere-ocean interactions,

seasonal contrast, and forcings/associations with solar- and Milankovitch cycles. Furthermore, we invite contributions on proxies calibration and validation and multi-proxy interpretation in these high-resolution paleo-climate archives. (1, 8)

### 071: Deep-Sea Conservation Imperatives in the 21st Century

*Organizers:* Lisa A. Levin, Scripps Institution of Oceanography, llevin@ucsd.edu; Cindy Van Dover, Duke University Marine Laboratory, clv3@duke.edu; Jeff Ardron, Marine Conservation Institute, Jeff.Ardron@Marine-Conservation.org; Craig R. Smith, University of Hawaii at Manoa, craigsmi@hawaii.edu

The deep waters and seabed of the world ocean constitute the largest biosphere on this planet, supporting a wealth of species and habitat diversity, performing key ecosystem functions and providing valuable food and energy resources. Once considered pristine, the deep sea (from 200-11,000 m) is under increasing pressure from potentially destructive extraction activities such as fishing, oil and gas exploitation and minerals mining, as well as waste and contaminant disposal, bioprospecting, and scientific research. CO<sub>2</sub>-driven climate change is also altering deep-sea species distributions and ecosystem processes with attendant effects on services and functions. In addressing these issues, EEZs and international waters face different regulatory landscapes. We invite talks that address conservation issues in pelagic and benthic realms of the slope, abyss and trenches. Topics of interest include but are not limited to human and climate-change impacts in the deep-sea, current conservation science issues and needs, marine policy instruments, management options, and global challenges. Presentations are welcome from science, industry, government and NGOs. (3, 9, 11)

### 072: Plankton Phenology: Drivers, Variability and Impacts

*Organizers:* Stephanie Henson, National Oceanography Centre, Southampton, S.Henson@noc.ac.uk; Rubao Ji, Woods Hole Oceanographic Institution, rji@whoi.edu; Martin Edwards, Sir Alistair Hardy Foundation for Ocean Science, maed@sahfos.ac.uk; Marie-Fanny Racault, Plymouth Marine Laboratory, mfrt@pml.ac.uk

The timing of seasonal events in plankton populations affect survival rates of their predators with knock-on effects on carbon cycling and higher trophic levels. Characterising plankton phenology is challenging because time series of data with relatively high temporal resolution are required. However, advances in our understanding of phenology have come from satellite ocean colour data, Continuous Plankton Recorder data and time series stations. Growing evidence shows that climate-related changes in forcing are driving shifts in plankton phenology, which are hypothesised to continue changing with projected global warming. In this session, we invite contributions that examine phenology in phytoplankton or zooplankton populations, environmental controls on variability on seasonal to decadal timescales and impacts of changes in phenology on higher trophic levels. Contributions based on in situ datasets, satellite data or model studies are all welcome. (3, 8, 9)

### 073: Compound Interest: Research + Energy + Outreach = Career and Personal Yield

*Organizers:* Liesl Hotaling, University of South Florida, lieslhotaling@yahoo.com; Gail Scowcroft, University of Rhode Island, gailscow@gso.uri.edu

The goal of this session is to inspire and empower scientists to engage in high quality broader impact activities and reach out to diverse audiences. Bringing the results of scientific research to the public is a growing opportunity and ongoing challenge. The requirement to address broader impact (NSF) created an incentive for scientists to integrate research and education at all levels, enhance the professional development of early-career researchers, and contribute to science literacy. This session invites posters about successful and potentially replicable broader impact activities, as well as strategies to make scientists' engagement in educational outreach easier and more rewarding. Presentations that expand scientists' awareness of broader impact endeavors are encouraged, as are those highlighting partnerships with formal and informal education organizations, professional societies, community-based groups, as well as print, radio, television, film and web-based initiatives. Posters that focus on gauging effectiveness of broader impact efforts are also of interest. (10)

### 074: The Changing Ocean Carbon Cycle: Data Syntheses, Analyses and Modeling

*Organizers:* Nicolas Gruber, ETH Zurich, nicolas.gruber@env.ethz.ch; Dorothee Bakker, University of East Anglia, D.Bakker@uea.ac.uk; Chris Sabine, NOAA PMEL, Chris.Sabine@noaa.gov; Toste Tanhua, IFM-Geomar, ttanhua@ifm-geomar.de

The ocean carbon cycle is changing at a rate whose magnitude and pattern we are only beginning to document, quantify, and understand. The uptake of anthropogenic CO<sub>2</sub> from the atmosphere, climate fluctuations as well as long-term trends in ocean circulation and biology have led already to substantial changes in the ocean carbon cycle, with potentially larger changes looming ahead. In the last decade, substantial efforts have been undertaken to measure these changes, and a number of projects are underway to synthesize them and to put them into the context of climate variability and change (e.g. international synthesis activities associated with the SOLAS-IMBER carbon working groups and IOCCP, including SOCAT, CARINA and PACIFICA, for example, but also those undertaken in the context of RECCAP). This session aims to bring together the scientists working on these synthesis projects, but is open to all other scientists who are interested in developing an integrated view of how the ocean carbon cycle has changed in the recent decades. Of interest are data syntheses, analyses and modeling studies focusing on air-sea CO<sub>2</sub> fluxes, changes in ocean surface and interior carbon properties, and how the changes in these realms are connected to each other. (4, 8, 16)

### 075: Optics and Acoustics in Turbulent Sediment Suspensions

*Organizers:* Paul Hill, Dalhousie University, paul.hill@dal.ca; Peter Traykovski, Woods Hole Oceanographic Institution, ptraykovski@whoi.edu; David Bowers, University of Bangor, oss063@bangor.ac.uk; Wayne Slade, University of Maine and Sequoia Scientific, wayne.slade@gmail.com

The goal of this session is to explore the links between suspended sediment dynamics and observed optical and acoustical

properties of sediment suspensions in coastal waters. The session is motivated by the fact that use of optical and acoustical sensors to monitor sediment suspensions is common in coastal waters, yet the physics of acoustic and optical scattering over the complete range of particle characteristics has several outstanding issues. Similarly, as hydrodynamic and sediment models in coastal waters become increasingly accurate, these models are being used to predict optical and acoustical properties, with the same uncertainties regarding conversion of suspension properties into optical and acoustical properties. Topics to be explored include, but are not limited to, how optics and acoustics respond to changes in sediment concentration, size, and composition, and more particularly how optics and acoustics respond to, and can be used to infer, the processes of particle aggregation, particle disaggregation, advection, settling, resuspension, and the interactions of particles, turbulence and bedforms. (1, 2, 12)

### 077: Data Systems that Support the US National Policy for the Stewardship of the Ocean, Coasts, and Great Lakes

*Organizers:* Cynthia L. Chandler, Woods Hole Oceanographic Institution, [cchandler@who.edu](mailto:cchandler@who.edu); Matthew K. Howard, Texas A&M University, [mkhoward@tamu.edu](mailto:mkhoward@tamu.edu)

The research disciplines of oceanography and limnology generate a vast amount of data, vast in scope and volume. The session chairs welcome contributions describing the full range of strategies and solutions at our disposal to meet the challenges presented by such diverse research disciplines. Contributions are encouraged that describe existing pragmatic systems for data stewardship and delivery as well as those describing visions of systems designed to support the complex challenges presented by Ecosystem Based Management and Coastal and Marine Spatial Planning requirements. The recommendations described in the Interagency Ocean Policy Task Force report released in July 2010 will require access to data, access beyond data discovery, access to knowledge. Data systems capable of supporting the new National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes will require 'data to knowledge' capabilities. While these systems may still be in the vision or developmental stages, they presume a foundation of curated data systems buoyed by effective data management practices. The session chairs encourage contributions that address the data management challenges and opportunities presented by the Task Force recommendations for better stewardship of the ocean, our coastal regions, and the Great Lakes. (11, 16)

### 078: The Fate of Discharged Hydrocarbons from the Macondo Reservoir and the Impacts to Gulf Ecosystems

*Organizers:* Joel Kostka, Georgia Institute of Technology, [joel.kostka@biology.gatech.edu](mailto:joel.kostka@biology.gatech.edu); Markus Huettel, Florida State University, [mhuettel@fsu.edu](mailto:mhuettel@fsu.edu); Ian MacDonald, Florida State University, [imacdonald@fsu.edu](mailto:imacdonald@fsu.edu); Samantha Joye, University of Georgia, [mandyjoye@gmail.com](mailto:mandyjoye@gmail.com)

The blowout of the Macondo reservoir beneath the Deepwater Horizon drilling rig resulted in the world's largest accidental release of hydrocarbons into the ocean in recorded history. Contamination of ecosystems by these hydrocarbons continues to cause severe environmental and economic consequences in the Gulf region. This session focuses on an understanding of the physical-chemical fate of the hydrocarbons and its impacts on ecosystem function in the Gulf of Mexico, including all

aspects of food webs from microorganisms to large mammals. Participation will be encouraged from researchers that employ interdisciplinary approaches including field observations, experimentation, technology development, and numerical modeling. Topics to be addressed will include: physical distribution and dispersion of oil with associated dispersants, biogeochemical degradation of oil hydrocarbons, and the environmental effects of hydrocarbons on planktonic and benthic communities from the deepsea to shallow coastal systems. The risk of accidental oil discharge to the marine environment remains high for the foreseeable future as increased economic pressure to access new oil reserves in deep marine waters will require less tested technologies. Thus, there remains a critical need to understand the fate and effects of oil and gas in order to support decision making, design management strategies and guide cleanup efforts. (3, 4, 14)

### 080: Coastal Connections: Advances in the Understanding of the Interaction of Fluvial and Marine Systems

*Organizers:* Katie Farnsworth, Indiana University of Pennsylvania, [kfarns@iup.edu](mailto:kfarns@iup.edu); Paul Liu, North Carolina State University, [jpliu@ncsu.edu](mailto:jpliu@ncsu.edu); Kehui Xu, Coastal Carolina University, [kxu@coastal.edu](mailto:kxu@coastal.edu); James Syvitski, University of Colorado at Boulder, [james.syvitski@colorado.edu](mailto:james.syvitski@colorado.edu)

Understanding the complex interactions in the coastal zone requires a focus on atmospheric, fluvial and marine processes as well as increasing anthropogenic influences. There has been tremendous growth in our understanding of the flux and fate of water, sediment and dissolved solids from land into the coastal ocean due to an emphasis on collaborative work between both modelers and field researchers. Much exciting and challenging work remains to link the sediment (both siliciclastic and carbonate) origin, transport and depositional processes and the responses at multiple temporal and spatial scales. In this session we hope to bring together researchers in terrestrial and marine sciences studying the coastal zone in diverse regions around the world. Study areas are broadly defined, including rivers, deltas, estuaries, continental shelves and others in the entire source-to-sink system. (1, 6)

### 081: Pelagic Primary and Secondary Production in the Gulf of Mexico

*Organizers:* Cynthia A Heil, Bigelow Laboratory for Ocean Sciences, [cheil@bigelow.org](mailto:cheil@bigelow.org); Gary L. Hitchcock, University of Miami, [ghitchcock@rsmas.miami.edu](mailto:ghitchcock@rsmas.miami.edu); Frank Muller-Karger, University of South Florida, [carib@marine.usf.edu](mailto:carib@marine.usf.edu)

Rates of pelagic primary and secondary productivity in the Gulf of Mexico vary from exceptionally high values in coastal waters to oligotrophic conditions in the central basin. Plankton communities in the Gulf are affected by anthropogenic activities that include riverine nutrients from the Mississippi River and crude oil from events such as the Deep Water Horizon disaster. While primary production rates are well-characterized in several coastal regions, relatively fewer observations exist for pelagic productivity, or respiration rates, in oligotrophic Gulf waters. Furthermore, linkages between primary and secondary producers are not documented for many regions in the Gulf of Mexico. This session focuses on production and respiration rates for primary and secondary producers in the diverse habitats of the Gulf of Mexico. Advances in defining rates from remote sensing are encouraged. (3, 9, 12, 14)

### 082: A Framework to Evolve the Global Ocean Observing System (GOOS): Focus on the Deep Ocean, and Emerging Biogeochemical and Ecosystems Essential Ocean Variables

*Organizers:* Albert Fischer, IOC/UNESCO, a.fischer@unesco.org; Eric Lindstrom, NASA, eric.j.lindstrom@nasa.gov

A Framework for Ocean Observing, developed out of the OceanObs'09 Conference (21-25 September 2009, Venice, Italy), takes lessons learned from the successes of existing ocean observing efforts, and guides the ocean observing community as a whole to establish the requirements for an integrated (from physics through biogeochemistry to ocean biology and ecosystems) and sustained global observing system, including the Essential Ocean Variables (EOVs) to be measured, the approach to measuring these, and the way in which data and products will be managed and made widely available. International ocean observing coordination mechanisms have begun to align their efforts to this Framework. The session will focus on two aspects of evolving the ocean observing system: the deep ocean, and emerging biogeochemical and ecosystems Essential Ocean Variables. Contributions are invited on developing readiness for deep ocean sustained observations. Contributions are also invited on defining the Essential Ocean Variables for biogeochemical, biological, and ecological processes in the ocean, and on developing readiness for requirements based on feasibility and impact, and in developing observing networks for sustained observation. (11, 13)

### 083: Using Satellite and In Situ Data Public Archives for Ocean Biology Research

*Organizers:* Watson Gregg, NASA/GSFC/GMAO, watson.gregg@nasa.gov; Margarita Gregg, NOAA/NODC, margarita.gregg@noaa.gov

National and international public data archives for ocean biological variables are now extensive. The plethora of these data, including satellite ocean color data products, in situ chlorophyll and nutrients, and others, can improve our understanding of biological dynamics from local to global scales, and days to decades. Combined with physical and chemical observations, the data archives enable us to assess the potential effects of natural variability and human activities on ocean biology. Ocean biological data also support modeling efforts, with data assimilation a new research focus. In this session we seek research efforts that utilize these public archives in data analysis, modeling, and data assimilation, as well as analyses that suggest new areas for improving the richness and diversity of these data holdings. (13, 16)

### 084: Advances in Flow-Topography Interactions

*Organizers:* Andrew Thompson, California Institute of Technology, aft26@cam.ac.uk; Igor Kamenkovich, University of Miami, ikamenkovich@rsmas.miami.edu; Stephanie Waterman, National Oceanography Centre, Southampton, stephanie.n.waterman@gmail.com

The importance of both large-scale and small-scale topographic features on moderating the ocean's large-scale circulation have long been appreciated. Improvements in the spatial coverage of observations, especially in polar regions, as well as improved resolution of numerical models have recently identified many dynamical processes that have modified our understanding of

how topography feeds back on ocean circulation and Earth's climate. These processes include, but are not limited to, modulation of Rossby wave propagation speeds, influence on the dynamics of large-scale currents and mesoscale eddies, control of material transport and mixing, eddy generation along boundary currents in marginal seas and water mass and tracer exchange across the continental shelves and slopes. Observational, modeling and theoretical studies are invited covering all aspect of topography-flow interactions, including control of topography on the large-scale circulation, interactions between topography and coherent eddies and jets, generation and modification of linear and non-linear waves, continental shelf/slope processes. (2)

### 085: Development of a Global Ocean Biogeochemical Observing System Based on Profiling Floats and Gliders

*Organizers:* Kenneth S. Johnson, Monterey Bay Aquarium Research Institute, johnson@mbari.org; Mary Jane Perry, University of Maine, perrymj@maine.edu; Herve Claustre, Laboratoire d'Océanographie de Villefranche, claustre@obs-vlfr.fr

Observing changes in biogeochemical processes at a global scale in a changing ocean is one of the most pressing issues in the ocean sciences. Changing oxygen levels, increasing acidity and greater thermal stratification all have the potential to substantially alter fluxes of carbon, oxygen and nitrogen. Yet there is no extant observing system capable of resolving these processes in situ at the global scale. Deployment of a global ocean observing system based on biogeochemical sensors on profiling floats and gliders is rapidly becoming feasible. In this session, we will focus on the potential for the development of such a system, which we call GLOBE (GLobal Ocean Biogeochemical Experiment). GLOBE would be modeled on the Argo system and would function as a biogeochemical Argo program (Bio-Argo) with open data access. We welcome presentations related to the development of a global network based on autonomous platforms, including the scientific need, analysis of data sets from profiling float and glider arrays, regional scale pilot-projects, development of models that would assimilate biogeochemical data sets, merging in situ and satellite data sets to obtain 3-D and 4-D views of ocean processes, and the development of additional biogeochemical sensors for this array. (13, 18)

### 086: Climate Change Impacts on Living Marine Resources

*Organizers:* Vincent Saba, Princeton University, vsaba@princeton.edu; Charles Stock, NOAA Geophysical Fluid Dynamics Laboratory, charles.stock@noaa.gov; Anne Hollowed, NOAA NMFS Alaska Fisheries Science Center, Anne.Hollowed@noaa.gov

We invite abstracts investigating the response of Living Marine Resources (LMRs) to anthropogenic climate change. A wide range of LMRs will be considered, including fish, mammals, reptiles, invertebrates, and plants. Studies focused on the detection and attribution of past climate change impacts on LMRs as well as those focused on assessing future impacts will be considered. We are particularly interested in contributions that explore the mechanistic linkages between climate-driven changes in physical properties and the eventual LMR response. These linkages can be challenging to diagnose because they occur across a broad range of spatiotemporal scales and be modulated by interactions throughout the marine food web.

Uncovering these linkages, however, is essential for improving projections of the impact of climate change on LMRs. (3, 8, 9)

### 087: Ocean-Atmosphere Processes of Monsoon Dynamics

*Organizers:* Hemantha Wijesekera, Naval Research Laboratory, hemantha.wijesekera@nrlssc.navy.mil; Harindra Joseph Fernando, University of Notre Dame, Harindra.J.Fernando.10@nd.edu; Raghu Murtugudde, Univ of MD, College Park, ragu@essic.umd.edu; Debasis Sengupta, Indian Institute of Science, Bangalore, India, dsen@caos.iisc.ernet.in

Monsoons dominate the regional climate of the tropics oceans and are themselves driven by land-ocean temperature differentials resulting from the seasonal cycle of solar forcing. The most striking and intense of all are the African-Asian-Australian monsoons (AAAM) centered on the Indian Ocean. These monsoons are not only intimately related to each other but also interact with the Indian Ocean on diurnal, subseasonal, seasonal-to-interannual and longer time-scales. AAAMs are not only rich in physical processes but also drastically affect the livelihoods of nearly half of the World's denizens, who depend on fisheries and food production based on timely monsoon rainfall. The Indian Ocean is an indicator of global warming due to its rapid warming that has outpaced the other oceans over the last several decades. Thus it is a natural laboratory for more intense studies of the air-sea interactions and exchange processes with the Pacific and the Southern Ocean. Air-sea interactions over the subregions such as the Bay of Bengal, the Arabian Sea, the equatorial and the southern tropical strips offer unique contrasts at diurnal to decadal time-scales. The surface and subsurface processes, buoyancy forcing, local and remote forcing at submesoscale to synoptic scales offer a rich spectrum of ocean-atmosphere processes that play a role in regional climate variability and change via monsoon dynamics. This session is devoted to papers on atmospheric-oceanic dynamics covering a range of space-time scales with the hope of discussing current state of the science and identifying knowledge gaps that will help design of future research programs. (2, 8, 17)

### 088: Consequences of the March 11, 2011 Earthquake, Tsunami and Fukushima Nuclear Power Plant on the Ocean

*Organizers:* Ken Buesseler, Woods Hole Oceanographic Institution, kbuesseler@whoi.edu; Motoyoshi Ikeda, Hokkaido University, mikeda@ees.hokudai.ac.jp

The March 11, 2011 earthquake off Japan and subsequent tsunami caused devastation on land and disruption of cooling systems at the Fukushima Dai-ichi nuclear power plant facility. The lack of adequate cooling led to overheating, venting of radioactive gases, explosions, fires and thereby atmospheric releases and fallout of radioactive contaminants. Water used to cool the reactors and spent fuel pond also led to considerable release of radionuclides to the ocean from direct run off and saturated soils and groundwater. This session seeks to bring together early data on the impact of these events on the ocean together with modeling results for a more comprehensive understanding of the event. This includes studies of the relative path and magnitude of the radioactive releases, range of radionuclides released, dose assessments, levels of contaminants in the sea water, sediment and biota, dispersion patterns measured and predicted for both near and far fields. Not only radioactive contaminant studies, but also work related to coastal flooding impacts and other non-radioactive pollutants (oils,

sewage, etc.) and their transport pathways are also appropriate for this session. A goal of this session is to share with the broader community our initial assessments of the ocean off Japan. (4, 14)

### 090: Enhanced Regions of Mixing in the Coastal and Deep Ocean

*Organizers:* Jeffrey W. Book, Naval Research Laboratory, jeff.book@nrlssc.navy.mil; Harindra J. Fernando, University of Notre Dame, Harindra.J.Fernando.10@nd.edu; Nicole L. Jones, University of Western Australia, nicole.jones@uwa.edu.au; Hemantha Wijesekera, Naval Research Laboratory, Hemantha.Wijesekera@nrlssc.navy.mil

The goal of this session is to present a diverse range of recent results regarding regions of enhanced ocean mixing, the processes which are influencing the enhancement, and the role that these areas play in larger regional or global mixing budgets. Specific regions of interest include, but are not limited to: rough or steep topography, strong frontal zones, regions of strong internal waves, and straits and constrictions. The range of possible topics includes observational studies, numerical modeling efforts, and parameterization/theoretical process studies. Some topics of interest are the interactions of scales, the role of horizontal processes in mixing enhancement, and efforts to observe and quantify these effects. (2)

### 091: Direct Measurement of Air-Sea Fluxes, Surface Waves and Oceanic Boundary Layer Turbulence

*Organizers:* Doug Vandemark, Univ. of New Hampshire, doug.vandemark@unh.edu; Will Drennan, Univ. of Miami, wdrennan@rsmas.miami.edu; Jim Edson, Univ. of Connecticut, james.edson@uconn.edu; J. Tom Farrar, Woods Hole Oceanographic Institution

The in situ measurement of turbulence and scalars associated with air-sea fluxes are continually improving thanks to rapidly expanding capabilities in ocean observing platforms and sensors as well as refinement in observational techniques. Moreover, it is now feasible and increasingly common to collect data over long periods of time and over a wider range of ocean-atmosphere forcing conditions such that a new level of certainty in air-sea flux estimation appears achievable. This session is aimed at fostering discussion of latest techniques and results surrounding the field measurement of mass, momentum and heat fluxes near the air-sea interface and within both ocean and atmospheric boundary layers as well as surface wave observations supporting these investigations. While the intended emphasis is on field observations and extended time series observations, activities related to modeling and remote measurements of fluxes and ocean surface waves are also encouraged. (2, 17)

### 092: Advances in Ocean Salinity Remote Sensing: Initial Results from the Aquarius/SAC-D and SMOS Satellite Missions

*Organizers:* Gary Lagerloef, Earth and Space Research, Lager@esr.org; Yi Chao, JPL/CalTech, Yi.Chao@jpl.nasa.gov; Jordi Font, SMOS-BEC/ICM-CSIC, jfont@icm.csic.es; Sandra Torrusio, CONAE, storrusio@conae.gov.ar

The Aquarius/SAC-D (launched June 2011) and SMOS (launched November 2009) satellite missions stand at the

frontier of ocean remote sensing by providing the capability to map sea surface salinity (SSS) variations globally. These new data offer unprecedented views on the coupling between ocean circulation, global water cycle and climate. The salinity measurement also presents formidable technical challenges for calibration and accuracy to advance the many science goals. This session will showcase the initial results from these two satellite missions including the early scientific findings, synergy with other satellite measurements, error analyses and the status of the data quality as compared to the available surface in situ observations. Contributions are also sought that address the potential research applications of the satellite salinity data through data analysis, modeling, assimilation, and prediction studies. In addition to salinity, the Aquarius/SAC-D mission provides measurements of ocean winds, rain rate, sea ice, and some limited-area sea surface temperature images, which may also be presented. (2, 12)

### 093: Pathways to Ocean Sciences: Broadening Participation in Summer Research for Undergraduate Programs

*Organizers:* Allyson Fauver, The Institute for Broadening Participation, [afauver@ibparticipation.org](mailto:afauver@ibparticipation.org); Thomas Windham, Private Consultant, [thomas.windham@comcast.net](mailto:thomas.windham@comcast.net); Janice McDonnell, Rutgers University/COSEE NOW, [mcdonnel@marine.rutgers.edu](mailto:mcdonnel@marine.rutgers.edu); Ashanti Johnson, The Institute for Broadening Participation, [ajohnson@ibparticipation.org](mailto:ajohnson@ibparticipation.org)

How can the Ocean Sciences summer research for undergraduates community best work together to address diversity and create positive change? Speakers will overview the current state of diversity in the Ocean Sciences community; offer a shared resource pool of references and strategies for broadening participation; speak to the importance of diversity in the science and technology workforce and the challenge of broadening participation as viewed through the success of the Significant Opportunities in Atmospheric Research and Science (SOARS) program, a highly diverse, multi-cultural research, mentoring and learning community; and present case studies from within the OS summer research community on successful efforts to overcome barriers to participation. (10)

### 094: Oceanic Impacts of Orographic Flows: Emphasizing Two-Way Coupling and Feedback Mechanisms

*Organizers:* Rui M. A. Caldeira, CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, [rcaldeira@ciimar.up.pt](mailto:rcaldeira@ciimar.up.pt); Julie Pullen, Maritime Security Laboratory, Stevens Institute of Technology, [julie@theworldisyourocean.net](mailto:julie@theworldisyourocean.net); Vanda Grubišić, University of Vienna, Department of Meteorology and Geophysics, [vanda.grubisic@univie.ac.at](mailto:vanda.grubisic@univie.ac.at)

Several processes occur between the atmospheric boundary layer (ABL) and the ocean surface, these processes mediate the exchange of momentum, heat and gas, with important environmental and/or climate impacts. Islands and mountainous coastal regions perturb the atmospheric (orographic) flows inducing strong impacts to the ocean's surface. Such regions function as ideal 'hot-spots' to study the coupled system, bringing together atmosphere and ocean scientists alike. On the other hand, extreme weather events such as hurricanes have also been used as case studies to further explore the air-sea coupling system. In this session, we propose to discuss studies, which contribute to improve our understanding of the dynamics occurring at the interface between the sea surface and the ABL,

including observations, numerical modeling and/or laboratory studies. To further improve the current state-of-the-art, we encourage the discussion of studies emphasizing two-way coupling and feedback mechanisms, which contribute to the improvement of monitoring and forecasting systems. (2, 17)

### 095: Detection and Analysis of Mesoscale and Submesoscale Eddies from Observational Data and Numerical Products

*Organizers:* Changming Dong, University of California, Los Angeles, [cdong@atmos.ucla.edu](mailto:cdong@atmos.ucla.edu); Sung Yong Kim, MPL, Scripps Institute of Oceanography, UCSD, [syongkim@mpl.ucsd.edu](mailto:syongkim@mpl.ucsd.edu); Pablo Sangra, Universidad de Las Palmas de Gran Canaria, [psangra@dfis.ulpgc.es](mailto:psangra@dfis.ulpgc.es); Milena Veneziani, OSD, University of California, Santa Cruz, [milena@ucsc.edu](mailto:milena@ucsc.edu)

It is well known that eddies play an important role in oceanic physical and biological processes, which have significant impacts on the climate and environment both locally and globally. The eddy generation and evolution mechanism is a fundamental geophysical fluid dynamics problem. Any reliable eddy data sets from observational data and numerical model products could facilitate better understanding of the above topics. To generate a reliable eddy data set, an efficient and reliable eddy detection scheme is very important. In recent years, eddy detection attracts board attention. Many automated eddy detection schemes have been developed, applied to both numerical products and observational data, such as sea surface height anomaly (SSHA), sea surface temperature (SST), ocean color, trajectory data from floats and sea surface drifters, and High-Frequency Radar mapped surface velocity. The special session will present all studies relevant to detection and analysis of mesoscale and submesoscale eddies from observational data and numerical model products, and their applications to physical, biological, climatological and environmental problems. (2)

### 096: The Biological Basis and Geochemical Consequences of Non-Redfield N:P Ratios in the Ocean

*Organizers:* Raymond Sambrotto, Lamont-Doherty Earth Observatory of Columbia Univ., [sambrott@ldeo.columbia.edu](mailto:sambrott@ldeo.columbia.edu); John Reinfelder, Rutgers University, Environmental Sciences, [reinfelder@envsci.rutgers.edu](mailto:reinfelder@envsci.rutgers.edu)

Although the ratio of major inorganic nutrients in the ocean's main thermocline is relatively constant, the ratio of phytoplankton consumption and export from surface waters is not. For example, the existence of relatively low N:P export has been established in multiple studies from high latitude, diatom-dominated environments and high N:P consumption characterize vast areas of lower latitude oligotrophic waters. Recent numerical simulations suggest that physical mixing can blend these differences between nutrient regimes to generate the canonical values in the thermocline of the Southern Ocean. In the eastern tropical South Pacific, differences in N/P uptake between upwelling and oligotrophic communities impact the typical geochemical approaches for estimating nitrogen fixation. This session will explore the biological generation of non-Redfield N:P signals in the surface ocean as well as their effects on the chemical composition of sub-surface water masses. Topics will include the physiological, cladistic, and ecological basis for the altered nutrient signature as well as the present understanding of its ultimate impact on regional and basin-scale nutrient distributions. (3, 4, 18)

### 097: Mixing and Transport Due to Nonlinear Internal Gravity Waves

*Organizers:* Oliver Fringer, Stanford University, fringer@stanford.edu; Subhas Karan Venayagamoorthy, Colorado State University, vskaran@engr.colostate.edu

Internal gravity waves play an important role in the mixing and transport of heat, salt, nutrients and other suspended matter in the ocean. There is substantial evidence to support the notion that the ocean overturning circulation is maintained by turbulent mixing due to breaking internal waves. In the coastal ocean, nutrient transport due to nonlinear internal waves is likely an important contributor to the health of numerous coral reef ecosystems. This session seeks to highlight recent advances in fundamental understanding of transport, stratified turbulence and mixing associated with nonlinear internal gravity waves. Observational, numerical modeling, and theoretical studies are welcome. (2)

### 098: The Critical Importance of Community Building in the Ocean Sciences

*Organizers:* Charna Meth, Consortium for Ocean Leadership, charnameth@gmail.com; Kristin Ludwig, Consortium for Ocean Leadership, kludwig@oceanleadership.org

Oceanographic research is inherently interdisciplinary and successful research in this field relies on collaborating across disciplines and institutions, sharing resources and data, and securing and maintaining different sources of funding. One of the hallmarks of a vibrant research community is effective communication to stakeholders, including the academic community, funding agencies, and the next generation of scientists. Ocean science researchers — organized by professional organizations, sub-disciplines, or facilities — must effectively share their progress, interests, and success to their stakeholders. This is not just an obligation; it is critical to the vitality of their programs. This session is focused on the importance of community building in the ocean sciences when creating research programs and ensuring their long-term success. It will include examples of mechanisms used by large programs to communicate to their scientific community and to entrain support from a broader network; discussion of the role of management, lead scientists, professional organizations, and communications professionals in building and fostering strong communities; and success stories of dynamic research programs. (10)

### 099: Temporal and Spatial Scales of Sea Surface Temperature Variability and its Impacts on Air-Sea Interactions, Weather, and Climate

*Organizers:* Gary A. Wick, NOAA ESRL, gary.a.wick@noaa.gov; Chelle Gentemann, Remote Sensing Systems, gentemann@remss.com; Andrew T. Jessup, Applied Physics Laboratory, University of Washington, jessup@apl.washington.edu; Carol Anne Clayson, Florida State University, clayson@met.fsu.edu

Knowledge of the spatial and temporal variability of sea surface temperature (SST) is important for the generation of satellite SST products and the understanding and interpretation of oceanic and interfacial processes. Important processes that lead to SST variability include diurnal warming, fronts, and wind effects. SST products are increasingly generated from the combination of observations at different times and spatial scales. Progress is being made in characterizing and accounting for the variability, but challenges remain in quantifying its

impact on the SST uncertainty budget. Spatial variability further influences scaling process observations to different resolutions, which requires assumptions about dependence of the structure of the process at several scales simultaneously. Current studies are exploring the impact of incorporating SST estimates with sub-pixel variability and improved resolution of the diurnal cycle on air-sea interactions and lower-frequency weather and climate variability. This session seeks to bring together those attempting to describe SST variability with those studying its impacts. Contributions are invited on all aspects of spatial and temporal SST variability, both observations and models, and studies on how this variability impacts air-sea interactions. Additionally, contributions that address the impact of variability on estimates of errors for observations are solicited. (2, 8, 17)

### 100: Linking Biogeochemical Processes to Estuarine Physical Dynamics

*Organizers:* Christopher Sommerfield, University of Delaware, cs@udel.edu; Elizabeth Canuel, Virginia Institute of Marine Science, ecanuel@vims.edu; Robert Chant, Rutgers University, chant@marine.rutgers.edu; Elizabeth Sikes, Rutgers University, sikes@marine.rutgers.edu

Physically mediated biogeochemical processes in estuaries play a central role in the fate of dissolved and particulate matter in the coastal ocean. Knowledge of cycling phenomena within estuarine basins is a critical component of terrestrial and ocean material budgets and has direct relevance to coastal and marine ecosystems. For example, understanding the composition, fluxes, and residence times of organic carbon is important for predicting oceanic responses to changes in past and future concentrations of atmospheric carbon dioxide. However, linking biogeochemical and physical dynamics is fraught with observational challenges. Indeed, with time-dependent spatial gradients in water properties and transport mechanisms, estuaries are paradoxically regions of both of rapid dispersion and trapping. Elucidating physical-biogeochemical connections thus requires observational approaches capable of identifying material sources, transport pathways, and process time scales. This may involve coordinated studies of fluid flow, radionuclide tracers, stable isotope proxies, and biomarkers, in conjunction with integrative conceptual or numerical modeling. We invite contributions that seek to link estuarine biogeochemical processes to physical dynamics on the full range of time scales. Possible topics include land-to-estuary routing of particulate organic and mineral matter, primary production, larval transport, nutrient cycling, and organic carbon dynamics. (2, 4,5,18)

### 101: Development of a Prototype, Science-based Coastal Information System for Routine Assessments and Monitoring of Coastal Zones in Developed and Developing Nations

*Organizers:* Hans-Peter Plag, University of Nevada, Reno, hpplag@unr.edu; Thomas C. Malone, University of Maryland Center for Environmental Science, malone@umces.edu; Paul M. DiGiacomo, NOAA/NESDIS, Paul.DiGiacomo@noaa.gov; Michael Bruno, Stevens Institute of Technology, mbruno@stevens.edu

Under the auspices of the Group on Earth Observations, the international body coordinating implementation of the Global Earth Observation System of Systems (GEOSS), the Coastal Zone Community of Practice (<http://czcp.org/>) seeks to develop a web-based prototype Coastal Information System

(CIS) that will enable routine, scientifically sound assessments of the condition of coastal ecosystems across the land-sea interface on a local to global scales. The initial focus will be on regions where there have been CZCP stakeholder workshops (the Mediterranean, west Africa, and the Caribbean) and regions where there is strong user interest and capacity for implementation. Papers are solicited that address the need to end (linking observations and models via data management and communications) development of a prototype CIS, including (1) identification of key indicators of ecosystem condition, (2) data requirements for computing these indicators (from both remote and in situ sensing), (3) observing system requirements for the provision of indicators of integrated ecosystem assessments at rates and in forms specified by decision-makers, (4) suitable web-based solutions to convey and deliver information in a timely manner, and (5) a component enabling contributions from "citizen scientists," which are of particular relevance in regions with gaps in monitoring infrastructure. (6, 11, 13, 16)

## 102: Live from the Ocean: Engaging Students and the Public in Active Research Projects at Sea

*Organizers:* Sharon Katz Cooper, Consortium for Ocean Leadership, scooper@oceanleadership.org; Leslie Peart, Consortium for Ocean Leadership, lpeart@oceanleadership.org; Jennifer Collins, Consortium for Ocean Leadership, jcollins@oceanleadership.org

This session will explore current tools and methods for engaging shore-based audiences in cutting edge ocean research projects - including the use of websites, blogs, social networking, and interactions with scientists through live video and audio broadcasts. How do we pique the interest of broader audiences in transformative ocean research and increase their understanding of the value of such projects to society? What kinds of programming has been successful? What size audiences participate? How do we measure success? Submissions are encouraged from projects sharing lessons learned, innovative programming, successes and challenges. (10)

## 104: Improvements in Understanding Tropical Atlantic Climate Variability and Predictability: Past Behavior, Observations and Climate Models

*Organizers:* Salil Mahajan, Oak Ridge National Laboratory, mahajans@ornl.gov; Takeshi Doi, Princeton University/Geophysical Fluid Dynamics Laboratory, Takeshi.Doi@noaa.gov; Ernesto Munoz, New Mexico Consortium, emunoz@newmexicoconsortium.org; Kelly H Kilbourne, University of Maryland Center for Environmental Science, kilbourn@umces.edu

Climate variability of the tropical Atlantic Ocean influences the climate of its surrounding regions by way of ITCZ variability, the Atlantic Meridional Mode, Atlantic Nino, Benguela Nino, the Atlantic warm pools and tropical cyclogenesis. The tropical Atlantic Ocean itself is influenced by remote forcings such as the El Nino Southern Oscillation (ENSO), Atlantic Meridional Overturning Circulation (AMOC) and the North Atlantic Oscillation (NAO). Recent years have seen a strong improvement in our understanding of tropical Atlantic variability and predictability via paleoclimate and modern observations, high resolution coupled climate modeling and statistical modeling on seasonal to decadal time-scales.

However, strong biases still exist in climate models over the tropical Atlantic. The goal of this session is to collectively discuss the current state of knowledge of tropical Atlantic climate variability and identify the research questions critical to a better understanding and prediction of its climate. Abstracts that discuss the variability of the tropical Atlantic, its response to natural and anthropogenic forcings and its influence on the global climate from either a modern or paleo-perspective are encouraged for this session. (2, 8, 17)

## 105: Vertical Flow in the Ocean

*Organizers:* Andreas Thurnherr, Lamont-Doherty Earth Observatory, ant@ldeo.columbia.edu; Eleanor, Frajka-Williams, eefw1u08@noc.ac.uk; Tamay Ozgokmen, University of Miami, tozgokmen@rsmas.miami.edu

The vertical velocity component is important for ocean dynamics on a vast range of scales, from the dissipation scale of turbulence to the global overturning circulation. In addition to directly influencing transport of biogeochemical tracers and larvae of many marine organisms, vertical velocity is dynamically significant for a variety of physical oceanographic processes, including deep convection and hydrothermal plumes, overflows and gravity currents, internal waves and tides, fronts, etc. For this session, we solicit papers on any aspect of vertical flow in the ocean, including measurements, numerical modeling and theory. (2)

## 106: Global Mode Waters: Physical and Biogeochemical Processes, Variability and Impacts.

*Organizers:* Young-Oh Kwon, Woods Hole Oceanographic Institution, yokwon@whoi.edu; Lynne Talley, Scripps Institution of Oceanography, ltalley@ucsd.edu; Shang-Ping Xie, University of Hawaii, Manoa, xie@hawaii.edu; Toshio Suga, Tohoku University, suga@pol.gp.tohoku.ac.jp

Mode waters are one of most notable features in the upper ocean, ubiquitously found in every ocean basin in association with strong currents. Mode waters in the Southern Ocean and North Atlantic are associated with large air-sea CO<sub>2</sub> exchange. Recent major field programs in the Gulf Stream (CLIMODE) and Kuroshio Extension (KESS), analysis of data such as those from Argo, and advances in theory and numerical modeling, are producing steady growth of understanding various mode waters and their dynamical and biogeochemical impacts. Abstracts are welcome that address various aspects of physical and biogeochemical processes associated with mode waters throughout the global ocean, their variability, and the impact on large-scale circulation, air-sea interaction, eco-system, and climate. (2, 4, 17, 18)

## 108: Biogeochemical and Sedimentological Factors That Influence Physical, Geotechnical and Mechanical Properties of Cohesive Sediments in Riverine and Littoral Zones

*Organizers:* Yoko Furukawa, Naval Research Laboratory, yoko.furukawa@nrlssc.navy.mil; Joseph Calantoni, Naval Research Laboratory, Joe.Calantoni@nrlssc.navy.mil; Allen H. Reed, Naval Research Laboratory, Allen.Reed@nrlssc.navy.mil; Tian-Jian Hsu, University of Delaware, tianjianhsu@gmail.com

This session aims to develop a community-wide understanding of the state-of-the-art for cohesive sediment dynamics in rivers, estuaries, and coastal zones. The physical, geotechnical and mechanical properties (e.g., fluid flow, strength, compressibility, erodibility) of cohesive sediments are profoundly affected by sedimentological, biological and geochemical processes. A quantitative understanding of how these processes interact at nano-, meso-, and field-scales and thereby govern the resulting effects is necessary in order to establish a predictive capability for littoral sediment dynamics and shoreline stability for applications such as coastal optics, engineering and environmental restoration. Topics may include but are not limited to: 1) sediment strength characterization from remotely sensed biological characteristics, 2) sediment resuspension as a function of the micrometer-scale physicochemical properties, and 3) sediment erodibility as a function of either the rapid (< seconds) flocculation pathways or the long-term (> months to hundreds of years) consolidation history. The processes span wide ranges of temporal and spatial scales, and thus abstracts from observational, theoretical, and modeling studies of different spatial and temporal scales are encouraged. The session will provide a forum for researchers to discuss and relate sedimentological, biological and geochemical processes occurring over a wide range of temporal and spatial scales. (1, 5, 6, 18)

#### 109: Integrating Oceanography and Animal Tracking - The Ocean Tracking Network

*Organizers:* Sara Iverson, Dalhousie University, Sara.Iverson@Dal.Ca; John Kocik, NOAA Fisheries Maine Field Station, jkocik@mercury.wh.whoi.edu; David Welch, Kintama Research Services, david.welch@kintama.com; Daniela Turk, Dalhousie University, daniela.turk@Dal.Ca

Climate variability, change, and anthropogenic activities affect the distribution, abundance and behavior of marine organisms. Newly available acoustic tracking observations and closer collaboration between oceanography and marine biology research is needed to address how changing ocean dynamics impact ocean ecosystems, animal ecology, and ocean resources. This session aims to bring together both marine biology and oceanography researchers to improve our understanding of the linkages between physical, chemical, and biological oceanographic conditions and the population structure, dynamics, movement, and critical habitat of key marine organisms (from eels to whales). We invite contributions from modeling and observation studies, and those which are planning to use, or could benefit from acoustic tracking and co-located oceanographic data from the Ocean Tracking Network. (2, 3, 8, 13)

#### 110: Dynamics of Fjords and High Latitude Estuaries

*Organizers:* W. Rockwell "Rocky" Geyer, Woods Hole Oceanographic Inst., rgeyer@whoi.edu; Parker MacCreedy, University of Washington, p.macc@uw.edu; Fiama Straneo, Woods Hole Oceanographic Inst., fstraneo@whoi.edu; Lars Arneborg, University of Gothenburg, laar@gvc.gu.se

Recent studies of the melting of glaciers and the warming of the Arctic region has rekindled interest in the dynamics of fjords and high-latitude river outflows. The estuarine research community has made significant progress in recent years in understanding shallow estuaries in mid-latitude settings, but fjords and high-latitude estuaries have been largely overlooked. This session seeks

to bring together the researchers who are making pioneering measurements of these high latitude systems with the estuarine researchers interested in broadening the application of their theory, observational methods and models to a wider range of estuarine environments. Papers addressing fjord and high-latitude estuarine processes are particularly encouraged, but we are also interested in comparisons between fjords and other, more well-studied estuarine environments. (2, 5, 7)

#### 111: COSEE: Science Communication Courses: Giving the Next Generation of Scientists a Voice

*Organizers:* Eric Simms, Scripps Institution of Oceanography, UCSD, esimms@ucsd.edu; Janice McDonnell, Institute of Marine and Coastal Sciences, Rutgers University, mcdonnell@marine.rutgers.edu; Craig Strang, Lawrence Hall of Science, UC-Berkeley, cstrang@berkeley.edu

The need for pre-career scientists to develop knowledge and skills to communicate effectively with diverse audiences continues to grow, and evidence suggests that training opportunities should be comprehensive and meaningful. Formal science education and communication courses can offer undergraduate and graduate science students an extended experience to explore and "field test" current theory and best practices related to science learning, communication, and pedagogy. The skills developed in such courses can serve as a foundation for effective K-12, undergraduate, graduate and informal teaching and communication throughout a developing scientist's career. This session will feature formal course models being employed in the earth and ocean sciences that focus on strategies for K-12 teaching, post-secondary teaching, informal education, outreach, public speaking, media, and/or journalism. Presenters are encouraged to share effective practices and lessons learned, especially as they relate to current research findings in education and cognitive sciences. (10)

#### 112: Ocean Spreading Centers: Connecting the Subseafloor with the Open Ocean

*Organizers:* Sarah Bennett, NASA JPL, CalTech, saroban@gmail.com; Jason Sylvan, University of Southern California, jsylvan@usc.edu

Deep-sea hydrothermal systems provide a window into the subseafloor environment and a transport mechanism for fluids sourced deep within the earth's crust out into the open ocean. At the interface between the seafloor and the ocean, fluids flowing from the crust provide a redox rich environment which is exploited by both micro- and macro organisms. Even up in the water column, chemistry and biology sourced from deep within the crust continues to influence the open ocean on a global scale. This session aims to bring in chemical, biological and geological studies from each of these environments, to provide our audience with perspectives from the hydrothermal system as a whole and the interconnectivities between each locality. We encourage contributions from both field and laboratory studies that investigate the influence of hydrothermal circulation on the subsurface, seafloor and open ocean, as well as how the local environment affects the fluids themselves. The combination of biogeochemical studies in extreme environments such as the hydrothermal system, will enable us understand the limits and constraints on life, which not only has important relevance for our own planet, but also for the extraterrestrial system. (1, 3, 4, 18)

### 113: Dynamics of the Deep Gulf of Mexico

*Organizers:* Dmitry Dukhovskoy, COAPS FSU, ddukhovskoy@fsu.edu; Steven Morey, COAPS FSU, smorey@fsu.edu; Cortis Cooper, Chevron Energy Technology Co., cortcooper@chevron.com

An acceleration of observational and modeling studies over the past decade has changed the view of the deep Gulf of Mexico from being a relatively quiescent abyss to a very energetic environment. Recent research highlights the importance of dynamical processes such as internal topographically trapped waves, baroclinic tides, and deep eddies in the Gulf and suggests that a primary source of energy to the deep Gulf is the penetration of the Loop Current, a branch of the upper ocean western boundary current that flows through the basin. Yet the energy transition from the upper ocean to the deeper layers is unclear. Recent advances in this area have shed light into the deep dynamics that are influenced by the strong upper ocean currents and eddies. This session seeks contributions that present new insight into the dynamics of the deep Gulf of Mexico, the mechanisms by which energy is transferred to the deep circulation, propagation and distribution of energy throughout the basin, and interaction of the energetic circulation with topographic features. Talks and posters presenting results from recent and ongoing observational, theoretical, and modeling studies are particularly welcome. (2, 14)

### 115: Western Antarctic Ocean Ecosystems: Chemical, Physical, and Biological Connections

*Organizers:* Matthew M. Mills, Stanford University, mmmills@stanford.edu; Ken Mankoff, University of California at Santa Cruz, kdmankof@ucsc.edu; Ted Maksym, British Antarctic Survey, emak@bas.ac.uk

The rapidly changing environment along the western Antarctic continental shelf has generated a plethora of recent research activity. The Amundsen Sea sector has some of Antarctica's most rapidly thinning and accelerating glaciers, such as the Pine Island and Thwaites, which dynamically interact with coastal polynyas. The Antarctic Peninsula is experiencing some of the largest temperature changes on the planet. Additionally, the western Antarctic shelf is an area of high biological productivity. For example, the Amundsen and Pine Island polynyas regularly attain the highest chlorophyll concentrations and integrated rates of primary productivity of all Antarctic polynyas. However, we still have little understanding of the physical and chemical mechanisms that drive the high biological production here and our understanding of the spatial and temporal variability of these mechanisms and processes is limited. The proposed session invites presentations on the current state of knowledge concerning the physical and chemical environment within the Western Antarctic Seas and their coupling to the biological productivity of the region. Contributions addressing the circulation of circumpolar deepwater on the continental shelf, glacial ice and meltwater impacts on polynya chemistry, physics and biology, sea ice dynamics, or that make specific reference to multiple timescales and/or cross disciplinary boundaries (e.g. observations vs. modeling), are particularly encouraged. (2, 3, 4, 7, 9, 18)

### 116: Recent Advances in Linking the Microbiology and Biogeochemistry of Oxygen-Deficient Zones

*Organizers:* Rachel Horak, University of Washington, rahorak@uw.edu; Laura Bristow, SMAST, University of Massachusetts,

Dartmouth, lbristow@umassd.edu; Bonnie Chang, Princeton University, bonniec@princeton.edu; Loreto De Brabandere, University of Southern Denmark, loretodb@biology.sdu.dk

Oxygen deficient water columns in the marine environment (e.g. eastern tropical Pacific, Arabian Sea, Baltic Sea, Cariaco Basin) are host to a range of unique and globally significant elemental transformations. Of particular relevance in these waters are C, N, S, and metal cycles and the role microbes play in mediating and coupling these processes. The field of microbiology is evolving rapidly, and, along with advances in biogeochemical methods, has helped improve our understanding of elemental cycling in marine oxygen deficient zones. These microbially mediated redox transformations are far more complex than previously thought and we currently have only a hint of the genetic diversity and biological capabilities of the microbial assemblages in these zones. This session aims to bring together a diverse group of microbiologists, biogeochemists, and modelers to increase our understanding of marine oxygen deficient water columns and their underlying sediments. We encourage contributions that explore the microbial diversity and potential processes, biological rates, and environmental controls on microbially mediated elemental cycling in these regions. (3, 4, 18)

### 117: Communicating a Changing Ocean: Challenges and Opportunities Facing Scientists and Decision Makers

*Organizers:* Martha McConnell, The National Academy of Sciences, mmccconnell@nas.edu; Susan Roberts, The National Academy of Sciences, sroberts@nas.edu

Communicating changes in the ocean from human activities requires a different skill set than research, but can become an important component of an ocean scientist's career. Especially with implementation of the new National Ocean Policy, ocean and coastal scientists are needed more than ever to effectively communicate complex ocean and coastal science to a broad audience. Today our society must grapple with many issues such as ocean acidification, rising sea levels, increased ocean temperature, hypoxia, and pollution. How can oceanographers be more effective at communicating what they know and how they know it? What communication challenges do scientists face when changes may take place over many years before the negative effects on society are manifested? This session will explore recent advances in our knowledge of changing ocean and coasts, share techniques and examples for effective presentations of scientific information to decision makers and the public, and identify priorities for ocean and coastal science to solve emerging ocean environmental problems. Submissions are invited to share lessons learned about communicating the state of our oceans to various stakeholder groups, including policy makers, and describe factors that shape public understanding of a changing ocean. (10, 11)

### 118: Upper Ocean Turbulence and Its Impact on Air-Sea Fluxes

*Organizers:* Brian Ward, University College Galway, Ireland, bward@nuigalway.ie; Ann Gargett, Institute of Ocean Sciences, Canada, gargettann@gmail.com; Kai Christensen, Meteorological Institute, Norway, kaihc@met.no

The air-sea fluxes of heat, momentum, gas, water, and aerosols have been parameterised by atmospheric processes, primarily wind speed. However upper ocean processes such as turbulence plays an important role. This session invites contributions on topics

primarily related to observations such as:- Surface wave induced drift and mixing- Upper ocean turbulence and waves- Langmuir circulations/turbulence- Wave induced momentum and energy fluxes- DNS/LES modeling related to observations. (2, 17)

### 119: Advances in Monitoring the Ocean's Heat and Salt Balance

*Organizers:* Simon Good, Met Office, [simon.good@metoffice.gov.uk](mailto:simon.good@metoffice.gov.uk); Sydney Levitus, NODC, [Sydney.Levitus@noaa.gov](mailto:Sydney.Levitus@noaa.gov)

The Argo array of profiling floats has dramatically increased data coverage for temperature and salinity for the global oceans in the last 7 years. The calculation of global and regional heat and salt content changes have accordingly become more reliable, but the change in the ocean observing system has come with the challenge of systematic bias in the different parts of the ocean observing system both at present and historically. Presentations on advances in monitoring the ocean's heat and salt balance on regional and global scales, on quantifying uncertainties in these quantities and whether these place any limitations on our understanding of past changes, and challenges and solutions to biases introduced by different components of the ocean observing system are solicited for this session. (2, 8, 13, 16)

### 120: Ocean Debris and Toxic Releases

*Organizers:* Joseph P. Greene, Ph.D., California State University, Chico, [jpgreene@csuchico.edu](mailto:jpgreene@csuchico.edu); Seba Sheavly, Sheavly and Associates, [seba@sheavlyconsultants.com](mailto:seba@sheavlyconsultants.com)

Solid debris is accumulating in the oceans around the world endangering animal life, releasing toxic chemicals and collecting floating toxins that can enter the food stream through fish. Ocean debris is an environmental concern for California and other coastline states. Plastic debris is a major component of ocean litter. In California, more than 70% of marine debris collected from the beach was made from plastics. Plastics can cause harm to sea life through starvation, suffocation, infection, drowning, and entanglement. The sources of plastic trash can be attributed mostly to recreational activities. In North America, 53% of the collected items were related to shoreline and recreational activities, and 35% of the collected items were related to smoking related activities. The fate of plastics in the oceans can lead to fragmentation and result in slurry of plastic particles that can degrade and release toxic chemicals such as phthalates, flame retardants, BPA, antimony oxide, heavy metal inks, and styrene monomer as the plastics break down. Plastics can accumulate toxins floating in the oceans from persistent organic pollutants (POPs). POPs can include DDT, hexachlorobenzene, polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAHs) and brominated flame-retardants, among others. (4)

### 121: Remote Sensing of the Coastal Ocean Using Hyperspectral and Geostationary Satellite Imagers

*Organizers:* Curtiss Davis, Oregon State University, [cdavis@coas.oregonstate.edu](mailto:cdavis@coas.oregonstate.edu); Yu-Hwan Ahn, KORDI, [yhahn@kordi.re.kr](mailto:yhahn@kordi.re.kr); Jeffrey Bowles, Naval Research Laboratory, Washington D.C., [jeffrey.bowles@nrl.navy.mil](mailto:jeffrey.bowles@nrl.navy.mil); Robert Arnone, Naval Research Laboratory, Stennis Space Center, MS, [robert.arnone@nrlssc.navy.mil](mailto:robert.arnone@nrlssc.navy.mil)

The coastal ocean is one of the most valuable and over-utilized resources on the earth. Over a quarter of the World population

live in the coastal zone and the coastal ocean is heavily impacted by urban and agricultural runoff, overfishing, transportation, oil and gas production and many other uses. The coastal ocean is also optically complex with plankton blooms and coastal runoff and highly dynamic driven by tides and diurnal winds. Two new approaches are now available to address these issues; hyperspectral imaging to resolve the optical complexity of the coastal ocean and imaging from geostationary satellites to resolve the temporal dynamics. The Hyperspectral Imager for the Coastal Ocean (HICO) was launched in September 2009 and operates on the International Space Station. The first geostationary ocean color radiometer the Korean Geostationary Ocean Color Imager (GOCI) was launched in June of 2010. This session invites presentations on the processing and analysis of HICO and GOCI data, on science conducted in preparation for future hyperspectral or geostationary imagers and on plans and designs for those instruments. (6, 12)

### 122: Climate Change Impacts on the High-Latitude Ocean

*Organizers:* John Crusius, U.S. Geological Survey, Univ. of Washington, [jcrusius@usgs.gov](mailto:jcrusius@usgs.gov); Rob Campbell, Prince William Sound Science Center, [rcampbell@pwssc.org](mailto:rcampbell@pwssc.org); Andrew Schroth, US Geological Survey, Woods Hole, [aschroth@usgs.gov](mailto:aschroth@usgs.gov)

Climate change is most pronounced at high latitudes, yet these are among the most remote regions of the ocean and therefore often understudied. For this session we welcome contributions that examine possible impacts of climate change on high-latitude regions of the ocean, with particular emphasis on coastal systems. Perturbations to such systems might include changes in ice melt, stratification, ocean pH, nutrient supply, and in the spatial and temporal variability in nutrient limitation, among other possible impacts. We welcome presentations that provide new insight into biological, chemical and physical processes that are important in the high-latitude ocean, including presentations that discuss new data as well as modeling. (6, 7, 8)

### 123: Compound-Specific Amino Acid Analysis: A Rapidly Evolving Tool for Ecology, Paleoceanography and Biogeochemical Cycle Research

*Organizers:* Matthew D. McCarthy, University of California, Santa Cruz, [mccarthy@pmc.ucsc.edu](mailto:mccarthy@pmc.ucsc.edu); Brian Popp, University of Hawaii, SOEST, [popp@hawaii.edu](mailto:popp@hawaii.edu); Marilyn Fogel, Carnegie Institution of Washington, Geophysical Laboratory, [m.fogel@gl.ciw.edu](mailto:m.fogel@gl.ciw.edu)

Rapidly accelerating work on stable isotopic analysis of individual amino acids (CSI-AA) has demonstrated unique potential to understand food webs, track source and diagenesis of organic matter, and provide new paleoceanographic tools for unraveling past changes in the ocean's N and C cycles. While CSI-AA has been demonstrated in earlier work to address diverse questions ranging from the origins of amino acids in meteorites to quantification of the diets of modern pigs and ancient whales, realization that this class of compounds holds distinctive information has resulted in a resurgence of interest in CSI-AA. Currently evolving approaches include the application of carbon, nitrogen, and hydrogen isotopic analyses to study the ecology, diet, trophic position, and physiology of organisms ranging from microbes to metazoans. As more is unraveled in modern organism, CSI-AA is becoming a critical tool for investigation of biogeochemical cycling of detrital organic matter, paleoceanographic studies, and understanding the

diagenesis of organic matter in sediments. This session will focus on advances in the applications of CSI-AA to biogeochemical, ecological and physiological problems in marine and freshwater environments. We encourage submissions that focus on new techniques and approaches, as well as specific environmental applications. (3, 4, 13, 18)

#### 124: New Insights into the Early Life Stages and Reproductive Dynamics of Large Marine Vertebrates

*Organizers:* Joel Llopiz, Woods Hole Oceanographic Institution, jlllopiz@whoi.edu; Barbara Muhling, University of Miami Rosenstiel School Cooperative Institute for Marine and Atmospheric Science, barbara.muhling@noaa.gov; Kate Mansfield, Southeast Fisheries Science Center, NOAA/NMFS, kate.mansfield@noaa.gov; Lesley Thorne, Duke University Marine Laboratory, Nicholas School of the Environment and Earth Sciences, lesley.thorne@duke.edu

Large marine vertebrates, whether bony fishes, sharks, mammals, sea turtles, or birds, play critical roles in the functioning of marine ecosystems. Since the maintenance or rebuilding of large marine vertebrate populations is highly dependent upon successful reproductive events and the survival of the early life stages, the understanding of these processes is critical for effective management and conservation efforts. For many of these long-lived species, the 'lost years' during the early life stages (part or all of the juvenile stage, and including the larval stage for bony fishes) have been distinctly understudied. Yet, a recent increase in efforts is shedding new light on the early life stages of large marine vertebrates, as well as their reproduction. Examples of such research include the mapping of reproductive areas in relation to oceanographic conditions, understanding the processes influencing reproductive output, and investigating how the survival and behavior of early life stages vary with biotic and abiotic conditions. The comparative approach of bringing together knowledge and perspectives gained from studying this taxonomically broad but important group of organisms should provide greater insight into general patterns and processes influencing the survival and conservation of the world's large marine vertebrates. (3, 8, 9)

#### 125: Ocean Acidification in Coastal and Estuarine Environments

*Organizers:* Simone Alin, NOAA Pacific Marine Environmental Laboratory, simone.r.alin@noaa.gov; Adrienne Sutton, NOAA Pacific Marine Environmental Laboratory, adrienne.sutton@noaa.gov; Francis Chan, Oregon State University, chanft@science.oregonstate.edu; George Waldbusser, Oregon State University, waldbuss@coas.oregonstate.edu

Globally, anthropogenic emissions of CO<sub>2</sub> are driving significant changes in ocean carbon chemistry, including declines in pH and carbonate saturation states. In estuaries and coastal oceans, ocean acidification (OA) is occurring in the context of other natural and anthropogenic biogeochemical processes that may accentuate or mitigate the magnitude and impacts of OA. Understanding of how OA is progressing in these environments is critical to managing coastal and estuarine resources in a changing world. Because oceanic carbon chemistry changes can only be stabilized over centennial time-scales, identifying processes that can be managed to ameliorate the present and future impacts of OA will be particularly important. Creative interdisciplinary research is needed to examine the role of ocean acidification in coastal and estuarine ecosystems already altered by other biogeochemical processes. This session seeks

to showcase research that explores ocean acidification patterns and impacts on coastal and estuarine ecosystems. Submissions with a focus on biological, chemical, geological, or modeling aspects of OA along the continental margins are welcome. We particularly encourage submissions that address interactions between OA and other stressors, such as eutrophication, hypoxia, climate change, and pollution. (4, 5, 6, 8)

#### 126: Links Between Estuarine and Coastal Processes

*Organizers:* David A. Sutherland, NOAA, NWFSC, dsuth79@gmail.com; James A. Lerczak, College of Oceanic and Atmospheric Sciences, Oregon State University, jlerczak@coas.oregonstate.edu; Elizabeth W. North, University of Maryland Center for Environmental Science, enorth@umces.edu; Parker MacCready, School of Oceanography, University of Washington, pmacc@uw.edu

Over the past several years, major programs have begun to study the connections between estuaries and the coastal ocean, emphasizing the interactions among physical, biological, chemical, and geological processes. This session invites papers that advance our understanding of this important transition region and identify key questions and directions for future research. Topics might include how river plume dynamics affect coastal ocean circulation (and how estuarine exchange flows create and control river plumes), how species connect across these regions and the dynamical processes that regulate this exchange, how long term variability in coastal ocean properties influence estuarine systems, or how terrestrial influences (e.g., nitrate, pollution) brought to estuaries might impact the coastal environment. Papers that contrast regions or scales (small vs. large estuaries, tidal to interannual time scales) are also welcome. (2, 5, 6)

#### 127: Phytoplankton Fluorescence: Filling the Gap between Observations and Understanding

*Organizers:* Alexander Chekalyuk, LDEO of Columbia University, chekaluk@ldeo.columbia.edu; Yannick Huot, Département de Géomatique Appliquée, Université de Sherbrooke, yannick.huot@usherbrooke.ca

Measuring in vivo fluorescence from phytoplankton photosynthetic pigments can provide information regarding their biomass, physiology, photosynthetic rates, and community structure. Such measurements are highly sensitive, non-intrusive, rapid, and easy to carry out, which make them an attractive alternative to traditional techniques. However, the interpretation of fluorescence data remains challenging: applying insights gained in the laboratory to measurements taken in natural aquatic environments is difficult, and understanding the sources of variability observed in the field is complex. Nevertheless, from satellites to flow cytometers, from emission-excitation spectra to time-resolved measurements, a broad array of tools and protocols have been developed and utilized to address specific scientific questions. Recent advances in autonomous platform technology and the development of more informative and sophisticated instruments and techniques provide new unique observational and analytical capabilities. Yet, there seems to be a growing gap between our ability to make observations using the available technology and our capacity to interpret these observations for improved characterizations of the natural aquatic environments. To address this issue and to review recent advances, we invite submissions on all aspects of phytoplankton fluorescence with an emphasis on the interpretation and better understanding of in vivo and in situ field measurements. (3, 13)

## 128: Sensitivity Analysis, Data Assimilation and Uncertainty Quantification in Ocean Modeling

*Organizers:* Ibrahim Hoteit, King Abdullah University of Sciences and Technology, [ibrahim.hoteit@kaust.edu.sa](mailto:ibrahim.hoteit@kaust.edu.sa); Bruce Cornuelle, Scripps Institution of Oceanography, [bdc@ucsd.edu](mailto:bdc@ucsd.edu); Mohamed Iskandarani, Rosenstiel School of Marine Atmospheric Science, University of Miami, [miskandarani@rsmas.miami.edu](mailto:miskandarani@rsmas.miami.edu)

Quantifying uncertainties in ocean models and reducing them through data assimilation are essential steps towards accurate and dependable oceanic simulations and forecasts. Challenges in this area are numerous due to the non-linear interaction of multiple spatio-temporal scales, and due to uncertainties in physical processes, and various parameters and inputs. The problem is compounded by the paucity of data in space and time compared to the relevant dynamical scales, and by the presence of irreducible errors that need to be quantified and represented. This session will focus on new developments in sensitivity analysis in ocean models, forward propagation of model uncertainty, new data assimilation and uncertainty reduction techniques and applications, and quantifying uncertainties in ocean models simulations and data assimilation products. The goal of this session is to bring together researchers working in the areas of ocean data assimilation, ocean model sensitivity analysis, and uncertainty quantification, with the goal of discussing new technical developments and recent applications. We invite contributions dealing with all theoretical and practical aspects of data assimilation and uncertainty quantification in ocean models. (2, 13, 16)

## 129: Mechanisms of Nutrient Assimilation and Metabolism in Harmful Algal Bloom (HAB) Species

*Organizers:* James Ammerman, Stony Brook University, New York Sea Grant, [james.ammerman@stonybrook.edu](mailto:james.ammerman@stonybrook.edu); Christopher Gobler, Stony Brook University, Southampton, [Christopher.Gobler@stonybrook.edu](mailto:Christopher.Gobler@stonybrook.edu)

Harmful algal blooms (HABs) are an increasing problem in many marine and freshwater coastal regions. Increased nutrient fluxes and other anthropogenic factors have contributed to these blooms, while at the same time molecular and genomic methods are improving our understanding of the mechanisms of the assimilation and metabolism of these nutrients. This session will focus on these mechanisms, including those involved in the assimilation of both macro- and micro-nutrients (including metals and vitamins), in prokaryotic and eukaryotic HAB species in marine and freshwater environments. We encourage submissions that utilize any of a variety of methods including laboratory and field studies, as well as traditional and molecular approaches. (3)

## 130: Active Learning Approaches to Teach Concepts in Ocean Sciences

*Organizers:* Emmanuel Boss, University of Maine, [emmanuel.boss@maine.edu](mailto:emmanuel.boss@maine.edu); Sharon Franks, Scripps Institute of Oceanography, [sfranks@ucsd.edu](mailto:sfranks@ucsd.edu); Peter Franks, Scripps Institute of Oceanography, [pfranks@ucsd.edu](mailto:pfranks@ucsd.edu); Lee Karp-Boss, University of Maine, [lee.karp-boss@maine.edu](mailto:lee.karp-boss@maine.edu)

While incorporation of hands-on, and problem-based active learning practices into higher education classrooms has its challenges, for example, potential reduction in the volume of material covered, the benefits of active learning are

becoming increasingly clear: Active learning promotes deeper understanding and retention of key concepts and enables students to learn from each other as well as from the instructor. There are many kinds of active learning strategies including physical simulations and experiments, virtual (computer-based) simulations and experiments, group projects based applications of new knowledge to real-world challenges (including case studies) and games. This session is aimed at educators and future educators interested in sharing and demonstrating effective practices for active learning. Presenters are encouraged to actively engage the audience. Floor and table space will be available for presenters to set up learning stations. NB: participation as a first author in this session will be allowed to those who have submitted as first author to a science session and at no additional cost. (10)

## 131: Research Needs for Coastal and Marine Spatial Planning

*Organizers:* James Ammerman, Stony Brook University, New York Sea Grant, [james.ammerman@stonybrook.edu](mailto:james.ammerman@stonybrook.edu); Barry Costa-Pierce, University of Rhode Island, Rhode Island Sea Grant, [bcp@gso.uri.edu](mailto:bcp@gso.uri.edu)

Implementing Coastal and Marine Spatial Planning (CMSP) is an important part of the National Ocean Policy mandated by a Presidential Executive Order. While there is a much background data available for many coastal areas to help with CMSP, in many cases the available data needed for specific planning actions is inadequate to the task at hand. Rhode Island and Massachusetts are among the national leaders in this area, with the Rhode Island Ocean SAMP (Special Area Management Plan) a potential model for an overall planning framework that included approximately \$10 million of new ocean research, extensive stakeholder processes, and adaptive management plans. This session will address the needs for increased research, the types of research needed to support the implementation of CMSP, provide examples of such research, and also discuss ways to facilitate and support additional research for adaptive management. It will provide important information to researchers interested in directing their research to be more useful for CMSP. Submissions are encouraged from all involved with research to support CMSP, researchers, managers, and others. (9, 11, 13)

## 132: Physical and Biogeochemical Dynamics of Density Fronts, Bores & Gravity Currents

*Organizers:* Jonathan Nash, Oregon State University, [nash@coas.oregonstate.edu](mailto:nash@coas.oregonstate.edu); Alexander Horner-Devine, University of Washington, [arhd@u.washington.edu](mailto:arhd@u.washington.edu); John Ryan, MBARI, [cryjo@mbari.org](mailto:cryjo@mbari.org); Kristen Davis, Applied Physics Lab / University of Washington, [kadavis@apl.washington.edu](mailto:kadavis@apl.washington.edu)

Sharp density fronts are ubiquitous. They form at the edges of upwelled water, in estuaries, river plumes, mesoscale filaments, tidal intrusions and where internal waves shoal and break. They commonly appear in remote-sensed imagery, since they alter surface gravity waves (roughness) and represent a sharp boundary between water types (temperature, salinity) and biogeochemical processes (turbidity, productivity, nutrient concentration). Enhanced lateral and vertical circulation in fronts can enrich the supply of nutrients available for ecosystem productivity and strongly influence the distributions, transport and fate of plankton - with consequences for ecosystem function such as larval settlement and the spread of harmful algal blooms. Also, near-bottom fronts and bores can modify the turbulent boundary

layer which determines benthic-pelagic coupling and can suspend sediment, altering benthic communities and shaping bathymetry. Frontal propagation and turbulent exchanges may have profound biogeochemical consequences that are starting to be explored using new, high resolution in-situ sensors, remote techniques and numerical efforts. The goal of this session is to bring together the numerous observational, numerical and laboratory efforts that span a broad range of scales in order to synthesize the common aspects of their dynamics from both physical and biogeochemical perspectives. (2, 18)

### 133: Jets, Plumes, Eddies, and Waves as a Link Between Anisotropic Mesoscale Ocean Dynamics and General Circulation

*Organizers:* Oleg Melnichenko, International Pacific Research Center, School of Ocean and Earth Science and Technology, University of Hawaii, oleg@hawaii.edu; Nikolai Maximenko, International Pacific Research Center, School of Ocean and Earth Science and Technology, University of Hawaii, maximenk@hawaii.edu; Niklas Schneider, Department of Oceanography, School of Ocean and Earth Science and Technology, University of Hawaii, nschneid@hawaii.edu; Emanuele Di Lorenzo, School of Earth and Atmospheric Sciences, Georgia Institute of Technology, edl@gatech.edu

This session invites reports on observational, modeling, and theoretical studies, addressing ocean processes, responsible for formation of all kinds of anisotropic structures, involving mesoscale phenomena, as well as assessment of impacts of these processes on the climate system. The list of the structures includes, but is not limited to: (i) multiple alternating quasi-zonal jets, (ii) wave-like packets, (iii) beta-plumes appearing under various forces, (iv) striations, (v) organized systems of eddies, and (vi) preferred eddy paths. Investigations, relating two or more physics or illustrating applications to atmosphere, climate, biology, ecology, etc., are especially welcome. (2)

### 135: Imaging the Ocean Interior: From Seismics to Optics

*Organizers:* Robert Pinkel, Scripps Institution of Oceanography, rpinkel@ucsd.edu; Steven Holbrook, University of Wyoming, SteveH@uwyo.edu

As time progresses, more sensing systems are able to capture multi-dimensional data that can be displayed as two, three or four-dimensional images. The different views of the ocean obtained with these systems reflect specific properties being sensed as well as the space-time slice of reality that is sampled. In this session we compare, contrast and enjoy the differing views of the ocean obtained from acoustic forward- and back-scattering devices, optical systems, and tomographic arrays, as well as from point sensors on drifting-float arrays, moving profilers, AUVs, and gliders. The focus is not on image processing, rather on the extraction of scientific information: what is seen and what is missed by the various approaches. (2, 12, 13)

### 136: Influences of Environmental Variability on Top Predator Distribution, Abundance and Behavior

*Organizers:* Daniel Palacios, JIMAR and NOAA/SWFSC, daniel.palacios@noaa.gov; Mark Baumgartner, Woods Hole Oceanographic Institution, mbaumgartner@whoi.edu; Steven Bograd, NOAA/SWFSC, steven.bograd@noaa.gov; Elliott Hazen, JIMAR and NOAA/SWFSC, elliott.hazen@noaa.gov; George Shillinger, Center for Ocean Solutions, Stanford

University, georges@stanford.edu

Patterns in top marine predator distribution, abundance and behavior are influenced by spatial and temporal variability in the ocean occurring at a variety of scales. From diel periodicity in diving and acoustic behavior to distribution shifts caused by climate change, variability in oceanographic conditions and prey distribution can have profound effects on top marine predators. This session seeks to bring together biologists, ecologists, oceanographers, and conservation practitioners who are using cutting-edge instrumentation, numerical and habitat modeling, or other novel methods to investigate relationships between environmental variability and the ecology and/or management of predatory fishes, marine turtles, seabirds, pinnipeds and cetaceans. The session will focus on understanding the linkages between physical and biological processes across a variety of scales and on how these relationships can be used to manage and conserve top predator populations. (3)

### 137: Biodiversity, Biogeochemistry and Ecology: Establishing Linkages Between Molecular Diversity and Ecosystem Functioning

*Organizers:* Zackary Johnson, Duke University, zij@duke.edu; Maureen Coleman, University of Chicago, mlcoleman@uchicago.edu

With molecular, taxonomic, ecological and biogeochemical aspects, the term "biodiversity" broadly captures the breadth of organisms and their functioning within ecosystems. Technological advances have led to substantial progress in describing the molecular and genomic diversity of marine organisms and additional progress has been made using meta-analyses of large geospatially-explicit datasets. More recent efforts have sought to leverage these advances and link them to functional ecology (e.g. biogeochemistry) or to conservation and ecosystem management. Major programs including the Census of Marine Life, US NSF Dimensions of Biodiversity, the Gordon and Betty Moore Marine Microbiology Initiative and others have provided alternate frameworks for characterizing this biodiversity. Further, both observational and modeling efforts have emphasized the importance of the linking various metrics of biodiversity and in using data assimilation and theoretical approaches to characterize marine biodiversity. The goal of this session is to highlight recent progress and future opportunities in broadly describing the biodiversity of microbial to macrofaunal organisms using a variety of approaches at a range of scales. In particular, we encourage participation across multiple size scales of organisms and in using novel techniques to provide connections (or identify disconnects) across scales and different aspects of biodiversity. (3, 9, 18)

### 138: Networked Posters - A Means to Bring Interactivity to the Poster Session

*Organizers:* Mark R. Abbott, Oregon State University, mark@coas.oregonstate.edu; Dan Fay, Microsoft Research, Dan.Fay@microsoft.com

New technology, including networking, visualization, and computing, is driving new models of publishing. Although we tend to think only of new displays and new gadgets, with near-ubiquitous access to cloud-based resources, the scientific poster no longer needs to be a static display or confined to simple interactive choices by the viewer. Instead, we can think of a networked poster that receives real-time input from observing

systems, data bases, and models to produce a dynamic window into an ocean research question. This session solicits posters on any topic in ocean sciences that can demonstrate the value of real-time, networked connectivity to enable deeper scientific insight by the audience. High-capacity Internet connectivity as well as use of 42" plasma displays will be provided through the support of Microsoft Research. A limited number of submissions will be accepted due to presentation space constraints. (10, 15)

### 139: Governing Across Scales—Innovative Stewardship of Earth Systems: Creating a Global Large Marine Ecosystem Knowledge Network

*Organizers:* Harold P. Batchelder, Oregon State University, hbatchelder@coas.oregonstate.edu; Peter Fox, Renseselaer Polytechnic Institute, pfox@rpi.edu; Suzanne Lawrence, Independent, suzanne@suzannelawrence.net; Oran Young, Univ. California, Santa Barbara, oran.young@gmail.com

Overfishing, marine pollution, habitat loss and climate change are contributing to the degradation in the world's marine ecosystems. Prompt and potentially significant changes in the use of ocean resources are needed to overcome the negative consequences of human exploitation. Climate change has added new urgency to efforts to sustainably govern Large Marine Ecosystems (LME) as well as the accelerated recognition that ocean ecosystems not only affect climate processes, but are also substantially impacted by climate change. Investments in LME programs worldwide require implementation plans that are effective and efficient. What is presently lacking is a process to bring together existing knowledge networks to identify, review, and synthesize the best assessment and management practices among the community of LME practitioners dedicated to facilitating exchange of lessons learned. This session is designed to create a forum for sharing of information (e.g., data, lessons learned and best management practices) developed through various LME project processes among the global marine science community. The session will benefit all members of the ocean science community interested in building and maintaining a global knowledge network of policymakers and scientists committed to moving ecosystem based management and coastal and marine spatial planning from paper to practice. (3, 9, 11, 16)

### 141: Improving the Representation of Plankton Ecology in Earth System Models

*Organizers:* Irina Marinov, University of Pennsylvania, imarinov@sas.upenn.edu; Zhi-Ping Mei, Horn Point Laboratory, Univ. of Maryland, zmei@umces.edu; Tihomir Kostadinov, University of California Santa Barbara, tiho@eri.ucsb.edu; Anand Gnanadesikan, Johns Hopkins University, gnanades@jhu.edu

Since phytoplankton contribute 50% of total global carbon fixation, it is critical to understand through Earth System Models how climate change will affect primary production and ocean carbon cycling, and the potential feedbacks on climate. However, there is a gap between the increasingly detailed knowledge of phytoplankton physiology and ecology and their simplified representation in Earth System Models. This session intends to provide an avenue for observationalists, theoreticians and modelers to present recent advances in in-situ and remote sensing based observations of phytoplankton physiology and ecology, and their representation in regional to global ocean models. Relevant questions include: What are the recent advances and new challenges in modeling ocean ecology in

Earth System Models? Which are the important advances in observational (including remote sensing) and theoretical phytoplankton ecology, such as light, macro-and trace nutrient (co)limitations, elemental stoichiometry, size-scaling and size-structure, different tradeoffs among ecological traits, that might be critical for ocean carbon and nutrient cycling and storage, and thus need to make their way in the next generation of global climate models? How sensitive are the predicted biogeochemical cycles on the time scale of climate change to new ecological formulations and increased complexity of the Earth System models? (2, 3, 8, 9, 16)

### 142: Oceanic Fronts: Observations, Modeling, and Applications

*Organizers:* Igor M. Belkin, University of Rhode Island, igormbelkin@gmail.com; Peter C. Cornillon, University of Rhode Island, pcornillon@gso.uri.edu; Dongxiao Wang, South China Sea Institute of Oceanology, dxwang@scsio.ac.cn

Presentations are solicited on all aspects of oceanic fronts, with a special emphasis on observations, modeling, and data analysis, from in situ and remote sensing data. The scope of this session is global, with all spatial and temporal scales included, from small-scale fronts in coastal and offshore waters to large-scale trans-oceanic fronts. In particular, we invite presentations on front detection methods, algorithms, and validation studies, and on satellite image processing and pattern recognition issues relevant to front detection and mapping. Papers on biological, chemical, and geological aspects of fronts, as well as diverse applications, are especially welcome, including, but not limited to, the following topics: fronts and their role in the ecology of marine species (from plankton to whales); elevated productivity at fronts; fisheries and aquaculture; marine protected areas; concentration of pollutants at fronts; particle flux and sedimentation; and fronts' impact on cyclones, hurricanes and typhoons. (2)

### 143: Modeling Oceanic Pollutant Transport

*Organizers:* Christopher H Barker, NOAA Emergency Response Division, Chris.Barker@noaa.gov; Kris McElwee, NOAA Marine Debris Division, Kris.McElwee@noaa.gov; Amy MacFadyen, NOAA Emergency Response Division, Amy.MacFadyen@noaa.gov

Ocean circulation modeling is a field of study with many diverse applications. In the wake of the Deepwater Horizon oil spill, modeling of oil surface oil transport has been a particularly newsworthy application. Advances continue to be made in surface oil spill models, but their use is now comparatively well developed. By contrast, application of circulation models to the movement and dispersion of other pollutants, including marine debris, non-petroleum chemical releases, and unexploded ordnance, has not been developed or discussed to the same level. The need for understanding of these pollutants, including their movement and their impacts, has been underscored by recent events ranging from use of dispersant at depth in the Deepwater Horizon response to the marine debris and radioactive contaminant releases caused by the tsunami that struck Japan in 2011. Scientists across disciplines are exploring new approaches as well as new applications for existing techniques to address these issues and others. This session will highlight ongoing work and recent advances in data collection and assimilation, considerations of 3D modeling, and new applications of existing ocean circulation models to the varying problems of oceanic pollutant transport modeling. (2, 13, 14)

#### 144: Recent Advances and Challenges in Using Adaptive Sampling to Quantify Process and Test Oceanographic Hypothesis

*Organizers:* Percy Donaghay, Graduate School Of Oceanography, donaghay@gso.uri.edu; James H. Churnside, ESRL, NOAA Boulder, james.h.churnside@esrl.noaa.gov

There has been a growing recognition over the last 20 years that the biological, biogeochemical, and optical dynamics of marine systems are frequently dominated by episodic events or by processes that are spatially concentrated in regions of strong gradients such as those observed in chemoclines, thin layers and fronts. Although much of the progress in this area has been dominated by the use of adaptive sampling to guide the collection of discrete samples from ships for laboratory analysis, recent advances in sensors, deployment systems and near-real time data analysis has opened the door for the autonomous collection and analysis of these samples in situ. We are looking for papers in this session that either (1) illustrate the use of adaptive sampling for quantifying critical processes and testing hypothesis, and/or (2) illustrate potential solutions to the challenges in increasing the use of adaptive sampling from ocean observing systems. (13, 16)

#### 145: Physical, Chemical, and Biological Connections Between Coastal Zones (The Surfzone, Inner, Middle, and Outer Shelf and Continental Slope)

*Organizers:* Melanie Fewings, University of California, Santa Barbara, fewings@msi.ucsb.edu; Erika McPhee-Shaw, Moss Landing Marine Laboratories, SJSU, eshaw@mml.calstate.edu; Roger Samelson, Oregon State University, rsamelson@coas.oregonstate.edu; R. Kipp Shearman, Oregon State University, shearman@coas.oregonstate.edu

There are dynamical differences between sub-regions of the continental shelf: the surfzone, inner shelf, mid shelf, outer shelf, and shelf slope. The outer shelf and slope may be influenced by a shelf break jet, slope-water intrusions, and deep-ocean eddies interacting with the shelf. On the inner shelf, where surface and bottom boundary layers overlap, turbulence influences the entire water column; the geostrophic response to along-shelf wind forcing is weak compared to the mid- and outer shelf; cross-shelf winds drive cross-shelf circulation; and even offshore of the surf zone, circulation can be affected by surface waves. Dynamics near the coast can also include a non-geostrophic baroclinic response to the diurnal sea breeze, the development of intense fronts, buoyant coastal-trapped flows, and shoaling nonlinear internal waves that may drive a net circulation. These dynamics control cross-shelf transport between the coast and deep sea that affects distributions of larvae, harmful algal blooms, carbon, high or low oxygen waters, nutrients, and pollutants. We invite observational, theoretical, and modeling presentations addressing physical, biological, and chemical aspects of cross-shelf transport and the dynamics and consequences of interactions and connections between the shallow and deeper coastal zones. (2, 6)

#### 146: Zooplankton Feeding Ecology and the Biological Carbon Pump in the Ocean

*Organizers:* Stephanie Wilson, Arizona State University/ Bangor University, sewilso6@asu.edu; Susanne Neuer, Arizona State University, susanne.neuer@asu.edu

Zooplankton affect the efficiency of carbon transport in marine ecosystems. Investigations into the distribution and feeding ecology of zooplankton can help our understanding of how trophic interactions can affect the biological pump. Variations in zooplankton community structure and diet can differentially alter the transfer efficiency of sinking POC. In addition, variations in climate have also been shown to affect POC flux as well as zooplankton biomass and species composition. We invite contributions from studies which explore zooplankton distributions, trophic interactions and their importance in the biological carbon pump. (3)

#### 147: Infusing Biogeochemistry with Ecosystem Science

*Organizers:* Susanne Neuer, Arizona State University, susanne.neuer@asu.edu; Raleigh Hood, University of Maryland, rhood@umces.edu

The cycling and transport of organic carbon and energy in the ocean is mostly mediated by organisms. But biogeochemical studies often insufficiently consider ecological aspects, despite the apparent need to find a synergy between both when investigating and predicting flux of carbon and other elements in a changing ocean. For example, the community composition of primary producers influences the biological carbon pump, and higher trophic levels are important in their utilization, remineralisation and transport of organic matter to depth. In this special session we invite presentations of biogeochemical studies that consider aspects of organism and ecosystem dynamics, both from observational and modeling perspectives. (3, 4, 9, 18)

#### 148: Recent Advances in In Situ Chemical and Biological Measurements in Marine Environments

*Organizers:* Martial Taillefert, Georgia Institute of Technology, mtaillef@eas.gatech.edu; Brian Glazer, University of Hawaii, glazer@hawaii.edu

Oceanographic measurements are essential to study, preserve, and manage the oceans. Despite the rapid advances in oceanographic technology, chemical and biological measurements obtained in these environments rely largely on sampling and ex situ analyses of water, sediment, and mineral substrates, compared to the in situ capabilities of physical oceanographic measurements. To improve our understanding of the biogeochemical processes regulating the distribution and flux of elements between the seafloor, water column, and the atmosphere, it is necessary to monitor the geochemical and biological composition of marine environments continuously with high spatial and/or temporal resolution. The recent technological advances in instrument electronics, power generation, nanotechnology, and communication have boosted the development of in situ monitoring systems, and the new network observatory initiatives in the oceanographic community are in need of new instruments with in situ capabilities, chemical and biological sensors, and microbial incubation devices for a variety of applications. This session will regroup scientists interested in sharing their recent development in instrumentation or chemical and/or biological sensors for in situ measurements or automated sampling in a variety of marine environments, including hydrothermal systems, water columns, and sediments. (3, 4, 13)

### 149: Research Experiences of Undergraduates in Aquatic Sciences

*Organizers:* Russell Cuhel, Center for Great Lakes Studies, Univ. Wisconsin-Milwaukee, rcuhel@uwm.edu; Carmen Aguilar, Center for Great Lakes Studies, Univ. Wisconsin-Milwaukee, aguilar@uwm.edu

Increasingly complex, large-scale studies of aquatic ecosystems require broadly-trained yet disciplinarily-expert scientists for the 21st Century. A variety of laboratory research opportunities, from grant-supported undergraduate assistants to programmatic offerings such as the NSF-OCE Research Experience for Undergraduates (REU) Sites offer a valuable introduction to research activities and lifestyles. Distributed among a wide variety of aquatic research institutions, REU Sites in particular provide diverse project and informational experiences. This session specifically offers ANY undergraduates an opportunity to present their research findings in a collegial but lower-stress poster session amid the showcase of full-spectrum aquatic science presentations. Engaged in one of the premier aquatic science meetings of the year, networking and personal interaction facilitate recruitment of top candidates into the career path progression. Research experiences play very important roles in coalescence of a student's classroom learning with real world practice. This poster session showcases project results of mostly upper-division undergraduates working in aquatic science laboratories. All disciplines and many interdisciplinary topics are represented. The presentations provide a fine opportunity for scientists to establish interactions with potential graduate students or employees in a professional setting. The session has grown to be one of the largest single sessions, well attended by actively recruiting scientists. (10)

### 151: Low Latitude Riverine Influence and Impact on Ocean Biogeochemistry

*Organizers:* Will Berelson, University of Southern California, berelson@usc.edu; Ajit Subramaniam, Lamont-Doherty Earth Observatory, ajit@ldeo.columbia.edu

The influence of riverine discharge on oceanic ecosystems, chemical cycles and sedimentation extends well beyond the continental margins. Low latitude rivers may enter ocean ecosystems that have been primed by coastal and/or equatorial upwelling but more often, discharge into oceanic margins of the oligotrophic gyres. We welcome submittals on topics related to riverine discharge and oceanic biogeochemical interactions including: benthic-pelagic coupling, new measures of productivity and export in these systems, fluxes and elemental budgets, carbon sequestration, reverse weathering and biogeochemical/ecological interactions. (4, 5, 6, 18)

### 152: Polar Marine Microbial Ecology

*Organizers:* Rebecca J. Gast, Woods Hole Oceanographic Institution, rgast@whoi.edu; Robert W. Sanders, Temple University, sanders1@temple.edu; David A. Caron, University of Southern California, dcaron@usc.edu

Marine microbial communities play key roles in the trophic transfer of carbon in polar marine environments. Our knowledge of potential suitable habitats, diversity, trophic interactions and activity in seasons other than the brief polar

summers has grown dramatically over the past few decades. With changes in climate already occurring, polar researchers are poised to document and interpret the changes to microbial communities and their potential for ecosystem-level impacts. We encourage investigators to present their research on polar microbial (both prokaryotic and eukaryotic) ecology. Work with aspects of diversity, functional genomics, cellular biology, biochemical and/or physiological processes, and comparisons between polar regions are sought. (3, 7)

### 153: Interactions and Functional Diversity of Host-Associated Microbes

*Organizers:* Karla B. Heidelberg, University of Southern California, kheidelb@usc.edu; Torston Thomas, University of New South Wales, t.thomas@unsw.edu.au

The effect of environmental change on marine systems has gained great interest. Prime examples include the observation that increased atmospheric carbon dioxide alters the ocean's carbonate buffer system, which in turn has a dramatic impact on macroorganisms with carbonate structure (e.g. corals, shells). Those and other macroorganisms live and interact with a great diversity of microorganisms, forming a holobiont. Environmental change may alter those host-microbes interactions and hence may impact host health. This session explores topics related to various effects of environmental change on macroorganisms and their associated microbial diversity. (3, 8)

### 154: Contemporary Issues in Estuarine Physics

*Organizers:* Robert Chant, Rutgers University, chant@marine.rutgers.edu; Daniel Codiga, University of Rhode Island, d.codiga@gso.uri.edu; , Greg Gerbi, University of Maine, Michael M. Whitney, University of Connecticut, Michael. Whitney@uconn.edu

Over the past decade there have been considerable advances in our understanding of estuarine physical processes, such as stratification and exchange flow. For example, our understanding of lateral circulation, tidal asymmetries, and mixing dynamics have advanced from simple conceptual models based on descriptive studies to observational and modeling investigations that quantify their roles in estuarine circulation. Indeed, these new insights claim to modify the classic paradigm of estuarine physics first proposed by Pritchard over 50 years ago. However, although lateral flows, tidal asymmetries, and mixing cycles appear to be major players driving estuarine exchange, many aspects of estuarine physics can still be characterized by semi-analytic models largely based on the classic theory. This leaves the conundrum that although the importance of these processes is beginning to be understood, their detailed dynamics and specific effects remain uncertain. We invite talks that use theory, models, laboratory experiments and observations to characterize aspects of circulation, mixing and dispersion in estuarine systems. Topics include, but are not limited to, lateral circulation, vertical mixing, coherent structures, mechanisms driving dispersion, and effects of morphology. We welcome studies across a range of temporal and spatial scales, ranging from microstructure to basin scale and from intra-tidal to annual time scales. (2, 5)

### 155: Viral Infection in Grazers: Elucidating the Impacts of Viruses on Microzooplankton, Mesozooplankton and Marine Metazoa

*Organizers:* Ian Hewson, Cornell University, hewson@cornell.edu; Mya Breitbart, University of South Florida, mya@marine.usf.edu

Marine viruses have been recognized as significant agents of bacterial mortality in aquatic ecosystems, where they roughly balance rates of bacterivory, for well over 2 decades. However, viral infection may also impact higher organisms, including micro- and mesozooplankton, invertebrate, and vertebrate metazoa. Arguably the best known marine viruses are those of aquacultured crustaceans. Yet, there is a dearth of reports of viruses of these higher trophic levels in marine habitats. Recently, advances in genomic techniques and enhanced cultivation approaches have permitted the wider study of viruses of these organisms. This session will bring together researchers examining viruses across marine ecosystems, including aquaculture, mariculture, pelagic food webs and benthic metazoa. We welcome reports of novel marine viruses, estimates of viral impacts on host ecology and biogeochemistry, and epidemiological studies of zoonotic and ambient viruses in host populations. (3)

### 156: Satellite Remote Sensing of the Physical and Biogeochemical Processes of the Ocean and Their Interactions

*Organizers:* Samantha Lavender, ARGANS Ltd, samantha.lavender@argans.co.uk; Tim Liu, NASA, w.t.liu@jpl.nasa.gov

This session is held in conjunction with the International Society for Photogrammetry and Remote Sensing (ISPRS) WG VIII/9 Oceans. The aim is to highlight research that utilises satellite data to understand the changes and interaction amongst the biological, chemical and energy/water cycles in the ocean together with their influence on terrestrial and cryospheric changes. This reflects the increasing number of parameters that can be derived from space (e.g. salinity from the 2009 launched ESA MIRAS SMOS mission and near future NASA / CONAE Aquarius SAC-D mission; wind vector from the scatterometer on ISRO Oceansat-2) and the practical cross-discipline usage of them to understand oceanographic variabilities. (12)

### 157: Understanding Plankton Biogeography By Putting Functional Traits on the Map

*Organizers:* Andrew D. Barton, Massachusetts Institute of Technology, adbarton@mit.edu; Elena Litchman, W. K. Kellogg Biological Station, Michigan State University, litchman@msu.edu; Andrew J. Pershing, University of Maine & Gulf of Maine Research Institute, andrew.pershing@maine.edu

What determines plankton biogeography? The abundance of each species in a community is thought to be regulated by the interplay of its functional traits, biotic interactions, and the environment. The environment varies on spatial and temporal scales ranging from short-lived, small-scale fluid turbulence to long-term climate change through Earth history and in future warming scenarios, and is instrumental in driving the biogeography and community ecology of aquatic species. Much has been learned about the physical, chemical, and biological regulation of plankton biogeography from ecosystem modeling, concerted plankton surveys (e.g., the Continuous Plankton Recorder and Atlantic Meridional Transect), the fossil record, and more recently, molecular and genomic techniques, yet

many unknowns remain. Here we ask where and when, and why, are certain species with known functional traits successful in marine and fresh waters? Specifically, we invite laboratory, field, bioinformatic, and modeling submissions that seek to understand the spatial and temporal distribution of plankton taxa, broadly defined as zooplankton, phytoplankton, and bacterioplankton, by considering how their functional traits vary along environmental gradients at all spatial and temporal scales. We encourage submissions that seek to build enhanced, mechanistic understanding of plankton biogeography, with an eye toward "putting plankton functional traits on the map" (3)

### 158: Shedding Light on the Dark Ocean: Advances in Linking Physical and Microbial Oceanography to Biogeochemistry

*Organizers:* Gerhard J. Herndl, Dept. Marine Biology, University of Vienna, gerhard.herndl@univie.ac.at; Alexander B. Bochdansky, Ocean, Earth and Atmospheric Sciences, Old Dominion University, ABochdan@odu.edu; Javier Aristegui, Facultad de Ciencias del Mar, Universidad de Las Palmas de Gran Canaria, jaristegui@dbio.ulpgc.es; Dennis Hansell, RSMAS/MAC, University of Miami, dhansell@rsmas.miami.edu

In terms of volume, the dark ocean represents the largest oceanic subsystem. Long considered a rather homogeneous environment, new facts have emerged that demonstrate that the dark ocean harbors a similar diversity of microbes as the sunlit surface waters. Microbes with novel metabolic pathways have been identified both in meso- and bathypelagic waters. Albeit the metabolic activity of the dark ocean's biota is generally low, the sheer volume of the dark ocean results in major uncertainties on its role in the oceanic carbon cycling. Major research initiatives have been launched recently to link physical oceanography, marine biogeochemistry and microbial oceanography, and to specifically address major enigmas regarding the significance of the dark ocean in the global element cycling. This session invites contributions from all oceanographic disciplines that address all aspects of the dark ocean in the biogeochemical cycling of elements including particle formation, flux and utilization in the deep ocean. Welcome are also contributions linking microbial community dynamics to biogeochemical fluxes using innovative approaches. (3, 4, 18)

### 161: Characterizing the Variability of the Coastal Ocean and Its Implications

*Organizers:* Sung Yong Kim, Scripps Institute of Oceanography, syongkim@mpl.ucsd.edu; Anthony Kirincich, Woods Hole Oceanographic Institution, akirincich@whoi.edu

The rapid advancement of coastal ocean observational programs has enhanced our capability to capture the dynamics of coastal circulation. Coupled with this observational infrastructure, new satellite data products and advanced numerical modeling efforts allow us to investigate coastal processes including shelf, estuarine, and river flows at an unprecedented range of spatial and temporal scales, document their variability, and begin to investigate their implications. This session invites contributions that describe and interpret the dynamic nature of coastal circulation spanning from submesoscale to mesoscale and from episodic events to climate change. Presentations on observational and theoretical studies of circulation variability are recommended as are reports from recent process studies

addressing individual dynamical aspects. Results from interdisciplinary studies on biological implications related to coastal dynamics at these scales are also encouraged. (2, 6, 13)

### 162: Advances in Phylogeography and Connectivity of Marine Metazoans

*Organizers:* Ann Bucklin, University of Connecticut, ann.bucklin@uconn.edu; Timothy Shank, Woods Hole Oceanographic Institution, tshank@whoi.edu

Marine phylogeography (the study of geographical distributions of genetic lineages of a population or species) has advanced rapidly in recent years. Analysis of connectivity of marine animal populations, communities, and ecosystems has become a central focus in ocean science, with broad-reaching implications including: understanding of past future impacts climate change, management and conservation of marine resources, and spatial planning. Technological breakthroughs in genomics, metagenomics, and environmental DNA sequencing have provided access to a vastly expanded repertoire of molecular markers for non-model animal populations; statistical and analytical approaches have allowed integrated analysis of multiple characters; models have been developed to explore migration and gene flow of organisms over a range of ecologically- and oceanographically-relevant scales. This session will include analysis and modeling of the phylogeography of marine metazoans living in diverse environments (coasts and deep sea, benthic and pelagic, coral reefs and vents) over a range of temporal and spatial scales and patterns (local to global, cosmopolitan and endemic). (3, 9)

### 163: Adaptation to High CO<sub>2</sub> Oceans: From Experimental Evolution to Naturally CO<sub>2</sub> Rich Habitats

*Organizers:* Frank Melzner, IFM-GEOMAR Kiel, fmelzner@ifm-geomar.de; Sam Dupont, University of Gothenburg, sam.dupont@marecol.gu.se; Rainer Kiko, IFM-GEOMAR Kiel, rkiko@ifm-geomar.de; Brad Seibel, University of Rhode Island, seibel@uri.edu

Ocean acidification will impact marine habitats. Assessing vulnerability of species and communities is difficult, as experimental studies often are single species focused and short-term in duration. In this session, we want to explore the capacity of organisms to adapt to an altered carbonate system speciation by featuring experimental evolution studies. In addition, we want to encourage presentations on species and communities adapted to environments that naturally expose organisms to elevated pCO<sub>2</sub>, such as coastal hypoxic zones, volcanic vent systems, marine sediments, intertidal and oxygen minimum zones, but also stressful ontogenetic habitats, such as egg masses and egg fluids. We envision an interdisciplinary session that brings together ecologists, chemists, evolutionary biologists and physiologists. (3, 4, 8)

### 164: International Education and Outreach Activities

*Organizers:* Adrienne Sponberg, American Society of Limnology and Oceanography, sponberg@aslo.org; Bob Chen, University of Massachusetts - Boston, Bob.Chen@umb.edu; Melissa Ryan, Center for Ocean Science Education Excellence-Technology & Engineering for Knowledge (COSEE-TEK), melissa.oceantechnology@gmail.com

This session is intended to offer scientists and educators a chance to share and compare ocean science education and outreach

activities from around the world. Several common themes are expected to emerge including the lack of public understanding of the importance of the ocean to everyday life. Sharing the diversity of activities and approaches to education and outreach in different countries are likely to lead to new ideas about effective outreach strategies. We hope that presenters will form an international network of scientists and educators dedicated to improving an understanding of our "one ocean." (10)

### 165: Climate Change Impacts on the Bering Sea and Related Polar Seas: From Observation to Prediction

*Organizers:* Thomas Van Pelt, North Pacific Research Board, tvanpelt@nprb.org; Michael W. Lomas, Bermuda Institute of Ocean Sciences, Michael.Lomas@bios.edu; Mike Sigler, Alaska Fisheries Science Center, NOAA, mike.sigler@noaa.gov

Bering Sea and related polar oceans have experienced recent changes in ice and climate, ocean dynamics, biotic community structure and ecosystem function. Several large research programs have been working to provide the fundamental observations and information needed for vertically-integrated syntheses of climate-mediated oceanographic drivers and trophic interactions in polar marginal seas. Collaborating modelers are using these empirical data to model and predict the impacts of changing seasonal ice cover on ecosystem dynamics, commercial fisheries, and subsistence harvest. This session will provide a forum to discuss field observations gained from ongoing programs, the application of these data to prognostic models, and their linkages to other polar oceans in pursuit of improved stewardship of marine resources in the 21st century. (3, 7, 8)

### 166: Redox and Coordination Chemistry of Iron in Marine Systems

*Organizers:* James Moffett, University of Southern California, jmoffett@usc.edu; Katherine Barbeau, UC San Diego, kbarbeau@ucsd.edu

Iron undergoes redox cycling between Fe(II) and Fe(III), and is strongly complexed by organic ligands. In the upper ocean, organically complexed forms predominate and ultimately determine the reactivity and biological availability of iron. Fe(II) is produced through biological and photochemical processes and may at times be the predominant inorganic form of iron, even in oxygenated waters. Recent evidence suggests that the coordination environment of iron created through organic complexation may influence the kinetics and thermodynamics of redox cycling. This session is directed at investigators who are studying iron redox and complexation processes at the molecular level, and how those processes interactively influence biological iron utilization and cycling in diverse marine environments. Both field and laboratory-based investigations are of interest. While the session is focused on iron, studies of related processes with other transition metals are also welcome. (4)

### 167: Bridging the Gap Between Pure Aquatic Science and Environmental Assessment

*Organizers:* Michael Teasdale, AMEC Earth and Environmental, michael.teasdale@amec.com; Sebastien Donnet, AMEC Earth and Environmental, sebastien.donnet@amec.com

Environmental monitoring/assessment and aquatic sciences have typically followed divergent paths. Regulators and environmental consultants do not necessarily follow the most up to date

techniques with regards to aquatic environmental monitoring and environmental assessment. Paradigm shifts in the aquatic sciences continue to happen and be covered in the scientific journals and conferences but are not necessarily incorporated or known about in the applied sciences. This session hopes to recruit presentations of case studies where aquatic ecologists and environmental assessors have worked in conjunction to ensure that the techniques recently developed in academia have been successfully applied to an environmental issue. (9, 11)

### 168: Designing Ocean, Coastal, and Great Lakes Observing Systems to Address Societal Issues

*Organizers:* Ru Morrison, NERACOOS, Ru.Morrison@neracoos.org; Suzanne Skelley, U.S. IOOS Program Office, Suzanne.Skelley@noaa.gov; Harvey Seim, University of North Carolina, hseim@email.unc.edu

The need for observations in the ocean, coasts and Great Lakes is often cited but how do you decide what and how many observations are needed? A stakeholder driven approach focuses on providing information to address societal issues. An example would be the Regional Build Out Plans developed by the coastal component of the United States Integrated Ocean Observing System (IOOS®). The end-to-end plans were developed, in part, to inform mandates of the Integrated Coastal and Ocean Observation System Act of 2009 as well as to provide timely implementation guidance for the National Ocean Policy (NOP). This is particularly relevant for the NOP priority objective on "Ocean, Coastal, and Great Lakes Observations, Mapping and Infrastructure". Common guidance and templates allowed the eleven IOOS® regions to develop consistent plans ready to be synthesized into a national ocean observing plan. Abstracts are invited from similar regional observing system design efforts. (5, 6, 13, 16)

### 170: Adaptive Sampling of Coastal Waters Using Gliders and Autonomous Underwater Vehicles (AUVs): Novel Integration of Oceanography and Engineering Research

*Organizers:* Catherine Edwards, Skidaway Institute of Oceanography, catherine.edwards@skio.usg.edu; Fumin Zhang, Georgia Tech-Savannah, fumin@gatech.edu

Gliders and other autonomous underwater vehicles (AUVs) are valuable tools for coastal ocean research, and engineering applications of vehicle control strategies can significantly improve the scientific value of the data collected. Innovative use of gliders calls for new research in development and application of control algorithms based on real-time inputs such as vehicle position, physical and/or bio-optical data collected by mobile and stationary assets, and operational circulation and ecosystem model forecasts. This session encourages presentations on novel research that explores new ideas in AUV navigation, control, and adaptive sampling for coastal applications, with seamless integration of oceanography and engineering effort for glider and AUV missions. Submissions should contain ideas and results that are significant for both disciplines. (6, 13)

### 171: Acoustical Applications for Ocean Observing Systems

*Organizers:* Bruce Howe, University of Hawaii at Manoa, bhowe@hawaii.edu; Sue Moore, National Oceanic and Atmospheric Administration, sue.moore@noaa.gov; Brandon Southall, Southall Environmental Associates, Inc., Brandon.Southall@sea-inc.net

The oceans are largely transparent to sound, hence oceanographic, biological, and signal processing acoustic techniques are primary tools for ocean observation and engineering. The opportunities and value of acoustical observations and techniques within the integrated ocean observing systems are boundless, yet incorporation of these techniques within these systems has been opportunistic and ad hoc. Both regional and international coordination of acoustical applications is essential. Common passive or active acoustical systems can serve several multidisciplinary scientific and educational purposes, using the power and communications capabilities provided by the observing systems. The costs of acoustical components can be minimized by taking advantage of ongoing implementation and maintenance activities of the ocean observing systems. The enormous challenges of planning, implementing and data management specific to acoustics must be faced to bring acoustical tools to fruition for ocean observing systems. This topical session solicits papers relating to any of the wide-ranging applications of acoustics within the observing systems: engineering, biological, or remote sensing. One aim is to identify common acoustical elements shared by several disciplines, hence to identify those elements that may have priority for immediate deployment. Papers addressing "Data Management and Communications;" (DMAC) issues are particularly encouraged. (12, 13, 16)

### 173: Ocean Surface Waves and Interactions with Currents and Winds

*Organizers:* William Perrie, Bedford Institute of Oceanography, william.perrie@dfo-mpo.gc.ca; Ryan Mulligan, Queens University, mulliganr@civil.queensu.ca

This session will encompass observations, theory and model studies of surface waves, and their interactions with the upper ocean and the lower atmosphere, in coastal and open ocean environments over different spatial and temporal scales. We encourage studies that compare model results to in situ and remotely sensed data. When winds blow over the ocean, they generate surface waves and wind-driven currents; in turn, the currents and waves modulate the winds and the atmospheric boundary layer. In high winds, viz. hurricanes, the wind-generated waves have large amplitudes, and currents can be very strong. Large waves have strong nonlinear wave-wave interactions. These interactions affect momentum and energy fluxes and play a role in the evolution of waves during storms. Parameterization of the energy and momentum transferred to waves from the wind, and dissipated to the upper ocean, remain unresolved issues to this day. Exchanges are large during hurricanes, may reflect asymmetries of spatial variations of the wind and wave fields during the generation and development of given storms, which in turn may affect the air-sea fluxes of momentum and heat. This session will explore the fluxes between the upper ocean, surface waves, subsurface currents and the wind. (2, 17)

### 174: Ecosystem Science in the Gulf of Mexico: Knowledge Gaps, Science Needs, and Long-Term Plans for the Future

*Organizers:* Alan P. Leonardi, NOAA, Atlantic Oceanographic and Meteorological Laboratory, alan.leonardi@noaa.gov; Robert Haddad, NOAA, National Ocean Service, Office of Response and Restoration, robert.haddad@noaa.gov

The Gulf of Mexico coastal and marine ecosystems provide a host of ecosystem services, including fisheries, global nutrient cycling, carbon sequestration, and tourism and recreation. Recent events such as the 2010 Deepwater Horizon oil spill and the 2011 Mississippi River flooding are dramatic examples of anthropogenic and natural stressors that are influencing this large marine ecosystem and that have exposed the limits of our knowledge of the Gulf of Mexico ecosystem. This session will explore these gaps in knowledge, examine the research and science needs to support a long-term adaptive ecosystem approach to understanding and predicting changes to the Gulf's natural and human-based components, and propose the framework(s) and activities required to meet these needs and close our knowledge gaps in the future. (3, 9, 14)

### 175: Exploitations of Synthetic Aperture Radar for Winds, Waves and Data Assimilation

*Organizers:* Hans C. Graber, CSTARS - University of Miami, hgraber@rsmas.miami.edu; Theresa Paluszkiwicz, Office of Naval Research, terri.paluszkiwicz@navy.mil

Satellite-based radars are capable to observe the winds and waves on the ocean with higher resolution than any other satellite sensor. With radars operating both day and night and in all weather measurements of winds, waves and currents in tropical cyclones and storms are possible. New algorithms enable the generation of high detail wind and wave fields which are suitable for assimilation into coupled atmosphere-ocean models. Of interest are results of new algorithms capable of deriving high wind speeds and sea state in hurricanes and typhoons and modeling results when SAR data was assimilated into coupled models. (2, 12, 17)

### 177: Gelatinous Plankton: Ecology, Physiology and Economic Impact in the Changing World Ocean

*Organizers:* Anthony Moss, Auburn University, mossant@auburn.edu; Jamie Seymour, James Cook University, jamie.seymour@jcu.edu.au,

“Jellyfish,” as defined by Haddock (2011 ASLO Aquatic Sciences, Puerto Rico)—i.e. all forms of gelatinous body marine animals - are becoming increasingly obvious as both highly adaptable keystone predators—such as key members of the Ctenophora and Cnidaria, or, in the case of the Thaliacea, critical, sensitive primary grazers in highly partitioned regions of the world ocean. A great deal of hyperbole has developed around these still-enigmatic animals, and local governments and management groups are left uncertain as to their actual ecological and economic impact. This session will bring together plankton experts conversant on many areas of the ocean: coastal, shelf and blue-water open ocean, to attempt to accurately depict the current status of the gelatinous plankton in the changing world ocean. (3, 9)

### 180: Arctic-Subarctic Interactions

*Organizers:* Ken Drinkwater, Institute of Marine Research, Bergen, Norway, ken.drinkwater@imr.no; Tom Haine, Johns Hopkins University, Thomas.Haine@jhu.edu

The Arctic and the Subarctic are intrinsically linked, not only through exchange of water but also in the fluxes and movement of flora and fauna between the two regions. Both regions are experiencing profound changes under present warming and are predicted to be even more highly impacted under future global change. To understand how climate variability and change affect

will affect these marine ecosystems, it is essential to understand the role of physical and biological fluxes between the Arctic and Subarctic as well as the mechanisms that link the physical characteristics and biological systems of these ocean areas. This session will focus on the links between the Subarctic and Arctic regions in both the Pacific and the Atlantic, building upon ongoing studies and recent IPY results. Evidence is sought on role of the cold Arctic outflows on the physical conditions in the Subarctic and their subsequent effect on the biology and the influence of the warmer Subarctic inflows on the Arctic basin and shelves. Papers linking multiple trophic levels or biology and physics are especially relevant with interest in all taxonomic groups from bacteria to whales. Comparative papers between the Atlantic and Pacific exchanges are especially desired. (2, 3, 7, 8)

### 183: Chemical Signals That Mediate Biological Interactions and Community Dynamics in Marine Habitats

*Organizers:* Graham A. Ferrier, University of California Los Angeles, gferrier@ucla.edu; Ryan Ferrer, Seattle Pacific University, ferrer1@spu.edu

This session will explore the sensory stimuli that underlie species interactions and drive community processes in marine habitats, from open ocean to the intertidal. Topics will include the discussion of chemical cues that influence marine settlement, competition, predation, and defense. Additionally, signal generation and transport, as well as the mechanisms of signal detection, will be discussed. Presentations will focus on completely identified and characterized chemical signals, and presenters will emphasize their physiological, biological, and ecological implications. This session is meant to highlight recent advances in marine biochemistry and chemical ecology, as well as to spur interests in an under-explored field of marine science. (3,4,9)

## General Sessions

- 184: Geology and Geophysics
- 185: Physical Oceanography and Limnology
- 186: Biological Oceanography, Aquatic Biology
- 187: Chemical Oceanography, Aquatic Chemistry
- 188: Watersheds, Lakes, Rivers, Estuaries
- 189: Nearshore and Coastal Regions
- 190: High Latitude Studies
- 191: Climate Change, Environmental Change, Ocean Acidification
- 192: Ecosystems: Processes, Assessment, and Management
- 193: Education, Scientific Outreach, Scientific Workforce
- 194: Ocean Policy, Resource Management
- 195: Optics, Acoustics, Remote Sensing
- 196: Observatories, Operational Oceanography, New Technology
- 197: Oil Spill, Gulf of Mexico
- 198: Miscellaneous
- 199: Data Management
- 200: Air-Sea Interactions
- 201: Bio-geochemistry

## Other Sessions, Town Halls, Workshops, and Auxiliary Meetings

The schedule for all Town Halls, Workshops, and Auxiliary Meetings to be held during the conference week will be determined after the abstract submission date. To submit a request for an event such as those shown below, apply using the online application system on the conference web site by 7 October 2011. Complimentary meeting rooms at the Salt Palace will be provided on a space available basis.

### NOAA's Office of Ocean Exploration and Research - New Program of Telepresence-enabled Systematic Exploration

*Organizers:* Craig Russell, NOAA Office of Ocean Exploration & Research, [craig.russell@noaa.gov](mailto:craig.russell@noaa.gov); Katherine Croff Bell, Ocean Exploration Trust, [kcroff@gso.uri.edu](mailto:kcroff@gso.uri.edu)

The NOAA Office of Ocean Exploration and Research (OER) was created to increase the nation's understanding of unknown and poorly known ocean areas and phenomena, generate new lines of scientific inquiry and research, increase the pace and efficiency of ocean exploration through the use of advanced techniques and technologies, and disseminate discoveries and findings to a broad spectrum of users. The NOAA Ship Okeanos Explorer and the Ocean Exploration Trust's (OET) Exploration Vessel Nautilus are currently conducting telepresence-enabled exploration. Equipped with sonar equipment and remotely operated vehicles, the ships transmit information to shore-based Exploration Command Centers (ECC) and over the Internet to broadly distributed teams of explorers. The systematic exploration paradigm involves surveying large areas to provide high-resolution maps of the seafloor. These maps are used to define areas to be explored in greater detail using advanced remotely operated vehicles outfitted with high-definition video cameras and an array of oceanographic sensors. Using the OER and OET vessels, explorers investigate new ocean areas and phenomena from shore-based ECCs equipped to receive video, data and information in real-time. Systematic exploration is also designed to engage the public and stimulate the imagination by engaging them in the excitement of real-time exploration and discovery.

### Humor and Science: A Comical Look at Ourselves

*Organizers:* Jules S. Jaffe, Scripps Inst. of Oceanography/UCSD, Jules Jaffe; [jules@mpl.ucsd.edu](mailto:jules@mpl.ucsd.edu); Peter J. S. Franks, Scripps Inst. of Oceanography/UCSD, Peter Franks; [pfranks@ucsd.edu](mailto:pfranks@ucsd.edu)

This independent, evening session, outside of the scientific program, will be devoted to finding the humor in science, and presenting a lighter side of ourselves and our research to our colleagues. We solicit 15-minute satirical presentations exposing the humorous underbelly of our field in the vein of "The Onion," the "Annals of Improbable Research," or "The Far Side" cartoons. Talks will marry the keen observational powers of the scientist and humorist to show how alternate interpretations of facts can lead to fascinating and humorous conclusions. As examples of talks, the co-conveners are planning on presenting "The Gefilte Oceanographer" (Jaffe) and "The Great Sunglass Die-off of 2009" (Franks). We invite our community to participate in a forum that will permit us to convey a different, entertaining, and thought-provoking view of ourselves and our culture, however we will

discourage and even reject talks "in progress" that are vindictive and personal. Please submit a 200 word abstract with a title to Jules ([jjaffe@ucsd.edu](mailto:jjaffe@ucsd.edu)) and Peter ([pfranks@ucsd.edu](mailto:pfranks@ucsd.edu)) by the conference abstract submission deadline to be considered for a presentation.

### The Role of Social Media in Ocean Science and Conservation

*Organizers:* Miriam Goldstein, Scripps Institution of Oceanography, UCSD, [mgoldstein@ucsd.edu](mailto:mgoldstein@ucsd.edu); Andrew Thaler, Duke University, [andrew.david.thaler@gmail.com](mailto:andrew.david.thaler@gmail.com); Rick MacPherson, Coral Reef Alliance, [rmacpherson@coral.org](mailto:rmacpherson@coral.org)

Social media platforms have made it possible to access and disseminate information quickly, while bypassing gatekeepers common to traditional media. Ease of accessibility and the pervasiveness of social media provides a powerful tool for reaching many people directly. Experts can interact with the general public, leaving it to the audience to judge the value of their work. These tools for education, outreach, and activism have drawbacks. Without the quality control provided by editors and fact checkers, misinformation can be rampant and credibility compromised. Complicated messages can be difficult to deliver, target audiences can be challenging to segment, and there are few metrics for success. The objective of this session is for participants to share and discuss their experiences using social media for public outreach. We encourage participants to present specific examples, challenges, and lessons learned, and to discuss positive or negative interactions with online media. We also encourage broader, conceptual discussions of the role of social media in scientific and conservation discourse. To facilitate discussion, 5 minute presentations will be followed by 10 minutes of questions. By discussing successes, challenges, and lessons learned, this session will improve our ability to broadly communicate ocean science and conservation.

### RPM Challenge for Ocean Sciences

*Organizers:* Timothy Moore, University of New Hampshire, [timothy.moore@unh.edu](mailto:timothy.moore@unh.edu); Michael Novak, NASA, [michaelgeza@gmail.com](mailto:michaelgeza@gmail.com)

The oceans contain ancient songs of living creatures past and present. From the mysterious songs of the Humpback Whale to the chitter chatter of the Beluga Whale, songs permeate the aquatic medium. Songs also permeate our lives.

During the month of February, musicians from around the world - both professional and amateur - will be responding to the RPM Challenge ([www.rpmchallenge.com](http://www.rpmchallenge.com)). The 'challenge' is to record a CD of original music during the month of February. Now in its seventh year, the RPM Challenge has united a community in an event that has grown every year.

Building off the successful 'open mic' session from the Ocean Science meeting in Portland, Oregon in 2010, we will be offering the chance to musicians who will be attending Ocean Sciences 2012 to record an original song for a joint Ocean Science contribution to the RPM Challenge.

This will be a special workshop, and we will have recording equipment and microphones to record vocal tracks and instrument tracks. We will not have amplifiers, so logistically we may be limited to guitar or acoustic instruments only. Although the purpose of the session is to record anyone who has a desire to offer one of their original pieces of music as part of a group submission to the RPM Challenge represent-

ing Ocean Sciences, the larger goal of public communication and outreach is also an end result. All styles of music are welcome.

## The Future of Ocean Color Remote Sensing: Advancing the Science with the Next Generation of Sensors

*Organizers:* Claudia Mengelt, National Academy of Sciences, cmen-gelt@nas.edu; James A. Yoder, Woods Hole Oceanographic Institution, jyoder@whoi.edu; Paul DiGiacomo, NOAA/NESDIS, paul.digiacomo@noaa.gov

Ocean color remote sensing is an important tool for detecting regional to global trends and patterns in ocean biology and biogeochemistry. Scientists have made important discoveries during the SeaWiFS/MODIS era in a decade that has transformed the field. With the demise of SeaWiFS and the aging MODIS and MERIS sensors, the research community is preparing to transition to a new generation of satellites. Some of the new sensors, such as VIIRS, will potentially extend the SeaWiFS/MODIS time series for global coverage. Others offer new measurement capabilities that will, for example, improve imaging of coastal waters. This session, convened by the National Academy of Sciences, explores exciting research to develop and harness the new sensors' capability. During the transition, a range of research efforts—such as development of new algorithms and new approaches to merging data from multiple ocean color sensors—are required to generate the desired ocean color products. In addition, the advanced capabilities enable developing new products and testing of new research hypothesis. Speakers will present exciting new research results, algorithms, and/or approaches for ocean color remote sensing that will contribute to the successful transition to the next generation of sensors.

## Highlighted Topics Published within the Annual Reviews of Marine Science

*Organizers:* Craig Carlson, University of California Santa Barbara, carlson@lifesci.ucsb.edu; Stephen Giovannoni, Oregon State University, steve.giovannoni@oregonstate.edu

Marine science is based on interdisciplinary approaches that examine processes at distances from nanometers to ocean basins and time scales of nanoseconds to millennia. The many facets of marine science are explored in the relatively new volume of Annual Reviews called Annual Review of Marine Science (ARMS). The editorial committee of ARMS is excited to present this special session of invited tutorials. Authors of four outstanding reviews published within the past four volumes of ARMS will be selected to provide tutorials designed to cover the basic disciplines within marine science: Ocean physics, biology, chemistry and geology. These tutorials will synthesize recent advances and provide thoughtful perspectives on future directions for a broad audience of researchers and students.

## Abstract Preparation Specifications

All abstracts must be in English, using metric units. Do not include chemical or mathematical formulae, Greek characters, illustrations, figures, or photos. Use no smaller than 10-point type. Do not use any formatting such as italics, bold, or subscript (CO<sub>2</sub> becomes CO<sub>2</sub>). Do not indent paragraphs. Use a single space between sentences. Use only

the ANSI (American National Standards Institute) character set. Only 10 authors will be accepted for each paper. If you wish to acknowledge more authors, you may do so at the time of your presentation.

The title of the abstract must be in all caps and must not exceed 160 characters. The body of the abstract must adhere to a maximum count of 180 words, exclusive of the title and the author citations. Please make the abstract as informative and representative of your presentation as possible.

## Abstract Submission Procedures

The abstract submission deadline is 23:59 pm Central Daylight Time on 7 October 2011 (04:59 Greenwich Mean Time on 8 October 2011). In order for scheduling to be completed in a timely manner, all Internet and mailed submissions must be received by this date. (Mailed submissions must be sent in advance so they are received, not postmarked, by this date.) Stated guidelines and procedures must be followed exactly; if not, your paper will not be accepted. Abstracts can be submitted as follows:

1. Via the Internet. This method of submission is highly preferred. Visit the web site for complete instructions: <http://www.sgmeet.com/osm2012>.
2. By mail. Submit the abstract on a 3.5" floppy disk or CD (formatted for DOS) accompanied by one (1) original hard copy printed on white paper. All documents must be submitted in either WordPerfect for Windows or Microsoft Word for Windows file formats. Abstracts submitted in any other format are not acceptable and will be returned. Disks and CDs must be clearly and fully labeled with the name of the author to contact, institution name, mailing address, phone number, and e-mail address. Disk and CD submissions must include a hard copy of the abstract, no exceptions. E-mail and fax copies of abstracts are not acceptable. Include the completed registration and abstract submission forms along with the hard copy of the abstract. Please use a laser-quality printer to print the one hard copy required for mailed submissions. Send originals and diskettes to: Lynda West, 5400 Bosque Boulevard, Suite 680, Waco, TX 76710-4446, USA.

If you are not able to submit your abstract by one of these two methods, please contact Lynda West at 254-776-3550, or via e-mail at [lyndaw@sgmeet.com](mailto:lyndaw@sgmeet.com).

## Abstract Submission Requirements

An abstract submission fee of \$60.00 USD for professionals or \$30.00 USD for students is required for each submission, along with a fully paid registration. This fee is non-refundable should it later be determined you are not able to attend and make your presentation. However, registration fees are refundable under the registration guidelines.

All persons wishing to contribute an abstract must complete a registration form with payment for the abstract submission fee and full registration fee when submitting their abstract. Abstracts will not be accepted if payment for the one-day registration fee only is submitted. Only one paper per first author will be accepted. An abstract submission fee and registration fee paid by the presenting author must accompany each paper accepted. Poster presentations are strongly encouraged. To maximize one-on-one interactions, posters will be available for viewing the entire week, and specific poster sessions will be scheduled

not in conflict with oral presentations. All abstract submissions will be considered for poster presentation. Please keep in mind it may be necessary to accept for poster presentation some abstracts submitted for oral presentation and, likewise, those who submit abstracts for poster presentation may be asked to make an oral presentation.

The organizing committee encourages the submission of a second abstract if you would like to submit to an education, outreach or policy session (categories 10 and 11). Please see the session list for designations. There are no fees required if this is a second abstract. The second submission may be a poster instead of another oral presentation.

Specially designated overview presenters may be allowed to submit a second scientific abstract. For additional information, please contact Lynda West at 254-776-3550, or via e-mail at [lyndaw@sgmeet.com](mailto:lyndaw@sgmeet.com).

Originals, diskettes, and Internet submissions, along with their accompanying registrations, must be received by the submission deadline of 23:59 pm Central Daylight Time on 7 October 2011 (04:59 Greenwich Mean Time on 8 October 2011). As noted previously, an author's abstract and registration must be received at the same time regardless of how the abstract is submitted.

## Session Topic Codes

To assist the organizing committee in assigning your abstract to an appropriate session, you should use the session codes and enter your first, second, and third choices under the Session Topic Code portion of the abstract form. All three choices must be indicated in order for your abstract to be considered. Be sure to include the complete code for the appropriate session. While every attempt will be made to accommodate your session requests, the committee cannot guarantee your abstract will be placed in any of the sessions chosen. Priority is given to the overall scientific program and, therefore, final placement is solely at the discretion of the organizing committee.

## Previewing Abstracts

When you submit your abstract, you will receive a confirmation and will be given a login and password for making necessary corrections. Please check your abstract for errors after you submit.

## Author Notification

Presenting authors will receive electronic confirmation when the abstract and registration are received and will receive confirmation in this same manner when the abstract is accepted and assigned. Accepted abstracts will be posted on the website after the scientific program schedule has been determined. If confirmation and notification by electronic means are not possible, please indicate an alternate method of notification when you submit your abstract.

## Additional Charges to Authors

Any author who submits an abstract on a disk and then also submits via the Internet will be charged a non-refundable duplicate submission fee of \$60.00 USD professional category/\$30.00 student or early career category USD.

An author who submits the same abstract more than once via the Internet will be charged a non-refundable duplicate submission fee of \$60.00 USD for professionals/\$30.00 USD for students.

Likewise, any author who submits an abstract and then resubmits the same abstract with revisions or changes or sends in a request for the appropriate changes to be made will be charged a non-refundable abstract change fee of \$60.00 USD for professionals and \$30.00 USD for students.

## Important Notes

- Submission via the conference web site (<http://www.sgmeet.com/osm2012>) is recommended and highly preferred.
- Payment of the abstract submission fee and full registration fee is required, plus the completed form must accompany each abstract. (Abstracts will not be considered unless the presenting author has registered for the meeting and paid the full registration fee.)
- Second abstracts are permitted ONLY if submitting to an education, outreach or policy session, or presenting a tutorial in special session.
- Abstracts will not be accepted by fax or e-mail.
- Do not mail in any abstracts or registration materials if you submit electronically!
- Abstracts must adhere to the guidelines in this brochure.
- Only one paper per first author will be accepted.
- Duplicate submissions will be charged a non-refundable processing fee of \$60.00 USD for professionals and \$30.00 USD for students.
- It may be necessary to accept for poster presentation some abstracts submitted for oral presentation, and, likewise, abstracts submitted for poster presentation may be accepted as oral presentations.
- The submission deadline is 23:59 pm Central Daylight Time on 7 October 2011 (04:59 Greenwich Mean Time on 8 October 2011).

## Your Presentation

### Oral Presentations

Talks will be scheduled in 15-minute time slots. We strongly encourage a presentation of no more than 12 minutes to allow three minutes for discussion and to entertain questions from those in the audience. Session organizers may select one of their presenters to give an overview presentation. This presentation may be scheduled as two consecutive slots at the beginning of the session. The time limit will be strictly enforced to facilitate movement between sessions. When completing the submission form, please indicate your preference for an oral or a poster presentation, however you must be prepared to accept the assignment as either oral or poster. This will assist the selection committee in the proper placement of your paper.

Overview presenters may request the opportunity to present a second, 15-minute scientific talk under the normal submission rules. Please contact Lynda West, [lyndaw@sgmeet.com](mailto:lyndaw@sgmeet.com), if you have such a request. Information on preparing and submitting your oral presentation will be sent following the scheduling of abstracts.

## Poster Presentations

Posters will be displayed in specific session groupings for the entire meeting to maximize opportunities for viewing. Specific times for interactions with the presenters will be assigned at times not in conflict with oral presentations.

Posters will be 4-ft. x 4-ft. (121.9 cm x 121.9 cm) and the size requirements must be strictly adhered to so they fit within the assigned space. If your poster exceeds these specifications, it may be subject to removal.

FedEx Kinko's has several business centers in Salt Lake City, including one within three blocks of the Salt Palace Convention Center at 19 East 200 South. Contact FedEx Kinko's by telephone at 801-533-9444, or e-mail at [usa2401@fedex.com](mailto:usa2401@fedex.com). For convenience, laminated posters can be pre-ordered through FedEx Kinko's and picked up at their location. Normally, this service takes 24 to 48 hours and weekend hours may vary. Materials will need to be submitted in PDF format.

## Audio-Visual Equipment

Each session room will be equipped with a screen, LCD projector, computer, sound system, timer and laser pointer. All presentations will be preloaded into the computer by the A/V staff for the session room. The A/V staff member will provide you full instructions on using the presentation system.

## Exhibits and Additional Sponsorship Opportunities

An exhibit area will be set up at the meeting. Both commercial and non-profit exhibitors are encouraged to participate. The costs for exhibit booths are as follows:

Commercial (For-profit).....	\$1500.00 USD
Government Agency.....	\$750.00 USD
Non-profit.....	\$500.00 USD

The exhibit area will be located adjacent to the food court, break and poster areas, and is designed to maximize interactions with conference participants. Conference exhibit hours are Monday, 20 February through Thursday, 24 February 2012, 08:00 to 17:00. Set up time is scheduled for Sunday, 18 February, 12:00 to 17:00 and tear down will be on Friday, 25 February 08:00 to 12:00.

Exhibitors are invited to participate in the various social activities associated with the meeting by paying the guest/social fee of \$150.00 USD.

Also, several opportunities are available for sponsorship of various breaks, receptions, and other functions throughout the meeting. Please contact the Exhibits/Sponsorship Coordinator, Les Lemay, (254) 776-3550, if you would like more information.

## Special Opportunities and Information for Students & Early Career Professionals

In order to register as a student, you should be enrolled as a student in a college or university and currently attending classes. Early career participants are defined as individuals with less than 10 years since their last graduation.

## Student Travel Awards

*Student Travel Awards are open to all student members of TOS, AGU and ASLO.*

A limited number of travel awards will be available for students to defray the costs of registration and/or travel. In order to apply for a Student Travel Award, you must complete the Student Travel Award Application found at <http://www.sgmeet.com/osm2012>. In order for your Student Travel Award Application to be considered, it must be submitted at the same time as your meeting registration, payment, and abstract in accordance with all meeting deadlines. Any applicant must be a student member of any one of the three sponsoring societies and presenting at this meeting. Additionally, students should not have received previous travel awards from any of the three sponsoring societies. Travel awards will be paid in U.S. dollars only.

## ASLO Early Career Travel Grants

*ASLO members only*

A limited number of travel awards will be available for ASLO early career members to defray the cost of registration and/or travel to the meeting. In order to apply for an ASLO Early Career Travel Grant, you must complete the early career travel grant application found at <http://www.sgmeet.com/osm2012>. The application requires those interested to provide information about the need for funds. ASLO early career travel grant applications must be submitted at the same time as your meeting registration, payment, and abstract in accordance with all meeting deadlines. To be eligible, these should all be received in accordance with all meeting deadlines. Travel grants will be paid in U.S. dollars only.

## Outstanding Student Presentation Awards

Awards will be given for outstanding posters and talks presented by students at the 2012 Ocean Sciences Meeting. To be eligible, a student must be a member of one of the sponsoring societies and first author on research that has not been presented previously at other scientific meetings. Presentations will be judged on the basis of innovation/scientific insight, quality of experimental design/methods, and clarity/effectiveness of presentation. There is no need to apply; all eligible presentations will be evaluated in consideration for the awards.

## Student Poster Judging

Post-docs and professionals who are members of one of the sponsoring societies are needed to serve as poster judges. Each judge will be responsible for evaluating about 9-10 posters. If you are interested in volunteering, please check the appropriate box on the registration form.

## Student Mentoring

Another opportunity for post-docs is to volunteer as a mentor to undergraduate students. If you are interested in volunteering, please check the appropriate box on the registration form.

## Student Lounge/Career Center

Fostering communication among students and providing information about career opportunities is an important part of this meeting. An area of the exhibit hall will be reserved for a Student Lounge / Career

Center, allowing students to meet each other in a fun, relaxed setting. This center will also host the Career Bulletin Board, where prospective employers are invited to post job announcements and students are invited to post a one-page resumé.

## Student Social Mixer

An informal student social mixer will be held on Monday, 20 February 2012. Beverages and snacks will be available. All students are encouraged to attend.

## Student Workshops

Student Workshops will be held at the 2012 Ocean Sciences Meeting. Scientists from a variety of backgrounds will discuss topics in career development (e.g., publication and grant writing, communicating science, different career paths, etc.). A limited number of lunches will be provided to students who pre-register for the workshops. Further details about the workshops and registration procedures will be provided later.

## Room Sharing

If you are interested in finding a roommate to help defray costs during the meeting, please check the room sharing option on your registration form. We strongly encourage you to take advantage of this service as hotel costs can be expensive.

## ASLO Multicultural Program

Benjamin Cuker ([benjamin.cuker@hamptonu.edu](mailto:benjamin.cuker@hamptonu.edu)),  
ASLO Multicultural Program Director

Starting in 1990 the ASLO Multicultural Program has brought over 750 diverse undergraduate and graduate students to the annual ASLO meetings. The program features pre-conference dinner and field trip, meeting-mentors to help guide the students, a student-symposium, and various other activities. The goal of the program is to increase the human diversity of aquatic scientists. Please recommend appropriate students to apply for the program. This NSF sponsored effort is designed for US citizens and permanent residents, and does not include international students. The program supports the full cost of participation including travel, hotel, food, and meeting registration.

Applications for students to participate in the ASLO Multicultural Program are available at the program homepage: <http://www.hamptonu.edu/science/ASLO.htm>

### Meeting-Mentors Needed for ASLO Multicultural Program

The success of this program attributes to the many ASLO members who volunteered to be meeting-mentors over the years. We are once again soliciting ASLO members to share themselves with the next generation of ocean and aquatic scientists. Meeting-mentors first meet their charges at a 4:00 PM meeting on Sunday, Feb. 19 (so mentors need to arrange their travel schedule accordingly). At that time the mentors help their students to plan which sessions they will attend during the meetings. Mentors are expected to spend some time each day with their students, primarily attending some sessions together. Mentors are also expected to introduce their students to other scientists at the meetings. Volunteers should have a PhD (newly minted or

seasoned scientist are all welcome!). If you are interested in sharing your excitement for the science with some bright students, please e-mail a short CV (used to match mentors with students of similar interests) to Benjamin Cuker, ASLO Multicultural Program Director, at [benjamin.cuker@hamptonu.edu](mailto:benjamin.cuker@hamptonu.edu).

## Town Halls, Workshops and Auxiliary Meetings

The organizers of the meeting encourage the submission of requests for town hall meetings, workshops or other auxiliary meetings. All requests must be submitted using the on-line form and must be submitted by the abstract deadline date of 7 October 2011. No request will be taken following that date although you may still organize your own meeting or activity.

We encourage these events to take place during lunch or possibly in the evening. Meeting room space will be complimentary as long as there are rooms available. All other costs will not be covered.

## Social Events

### Opening Welcome Mixer Reception

Date & Time: Sunday, 19 February 2012, 19:00 – 21:00

The opening welcome mixer reception will be held on Sunday, 19 February 2012. Conference registration will be open just prior to the reception to allow you to pick up your conference materials.

### Poster Receptions

Posters will be available for viewing throughout the week. Refreshments will be served.

### Jam Session

This event will be an opportunity to enjoy the musical talents of fellow scientists. Having occurred during the 2010 meeting, quite a following has developed among both musicians and audience members. Relax at the jam session and spend time in a variety of ways - visiting with colleagues or performing with other scientists-musicians and providing an entertaining evening for everyone. Check <http://www.sgmeet.com/osm2012> for current information.

Musicians are invited to bring musical instruments and join the performance on the evening of Tuesday, 21 February 2012. For more information about the jam session and rental of musical instruments, contact Sue Rulla at 254-776-3550 or [suer@sgmeet.com](mailto:suer@sgmeet.com).

## Travel Information for Non-U.S. Attendees

The following information is provided in order to make international travel as convenient as possible for Non-U.S. attendees. The conference management staff is here to help whenever possible, providing letters of invitation to conference attendees who have completed the registration process. Letters cannot be issued to potential attendees until registration and full payment are made.

## Customs Information – Entry Regulations

People visiting from non-U.S. countries require a valid passport and possibly other documentation. Since obtaining travel documents outside the United States can take time, it is important to check with the nearest Consulate well in advance of a trip to the United States.

Citizens of 36 countries in Europe and the Far East may visit the U.S. for up to 90 days without a visa if the attendee has a passport with a computer-readable bar code under the Visa Waiver Program (VWP). Details can be found at the U.S. Department of State web site at [http://travel.state.gov/visa/temp/without/without\\_1990.html](http://travel.state.gov/visa/temp/without/without_1990.html) or contact your local American consulate. Attendees from Canada and Mexico are reminded to bring a valid passport to cross into the United States.

International visitors to the U.S. under the Visa Waiver Program are now required to apply for travel authorization online. To apply visit the Electronic System for Travel Authorization web site at [http://www.cbp.gov/xp/cgov/travel/id\\_visa/esta/](http://www.cbp.gov/xp/cgov/travel/id_visa/esta/).

If you do not already have current ESTA authorization, we recommend that you apply as soon as you know you will be traveling to the United States under the VWP.

## ESTA

Electronic System for Travel Authorization (ESTA) is an automated system used to determine the eligibility of visitors to travel to the United States under the Visa Waiver Program (VWP). ESTA approval authorizes a traveler to board a carrier for travel to the United States under the VWP.

ESTA is not a visa. It does not meet the legal requirements to serve in lieu of a U.S. visa when a visa is required. Travelers that possess a valid U.S. visa may travel to the United States on that visa for the purpose it was issued. Travelers traveling on valid visas are not required to apply for an ESTA. In the same way that a valid visa does not guarantee admission to the United States, an approved ESTA is not a guarantee of admission to the United States.

ESTA became mandatory January 12, 2009. VWP applicants are required to complete a green Form I-94W and a white Customs declaration upon arrival in the U.S. whether or not they have an ESTA authorization.

Approved ESTA applications are valid for a period of two years, and multiple trips to the United States without the traveler having to re-apply for another ESTA. The ESTA travel information may be updated before each trip to the U.S., but it is not required. When traveling to the U.S. with the approved ESTA, you may only stay for up to 90 days at a time - and there should be a reasonable amount of time between visits so that the CBP Officer does not think you are trying to live here. There is no set requirement for how long you must wait between visits.

Travelers whose ESTA applications are approved, but whose passports will expire in less than two years, will receive an ESTA valid until the passport's expiration date.

New ESTA authorization is required if:

- You are issued a new passport,
- You change your name (first and/or last)
- You change your gender
- Your country of citizenship changes

- Your circumstances change, e.g., you are convicted of a crime of moral turpitude or you develop a contagious disease. Such a change may require you to get a visa to travel to the U.S. You must re-apply and your application must reflect the change in your circumstances or you may be denied entry upon arrival in the United States.
- DHS recommends that you apply for ESTA authorization as soon as you know you will be traveling to the United States under the VWP.

## Currency and Banking

Official currency of the United States is the dollar, denoted by USD (\$). Automated teller machines (ATM) are available throughout the area. Locations may be found at <http://visa.via.infonow.net/locator/global/jsp/SearchPage.jsp> for Visa and <http://www.mastercard.us/cardholder-services/atm-locator.html> for MasterCard.

## Transportation

### Airlines

Daily non-stop service links Salt Lake International Airport and 90 other cities. Major carriers serving Salt Lake City include American, Continental, Delta, Northwest, Southwest, United and US Airways. American Airlines is the official carrier for this meeting and will extend discounted rates for those attending OSM 2012. Rates will be available from 21 February to 27 February 2012. You must use the American Airlines Discount number of **A1722AX** to receive the 5 percent discount rate.

Delta Airlines and their code share partners offer a 2 percent discount off of the lowest applicable fare. Mention the Delta Contract Number **413324** when making your reservation, or call 1-800-328-1111. If you need additional assistance in making airline reservations contact House of Travel, Waco, Texas at: 1-800-874-4731.

### Ground

The airport is located eight miles from downtown Salt Lake City allowing visitors quick access to hotels and convention facilities.

Salt Lake City is easily accessible by highway. Three interstate highways, I-15, I-70 and I-80, provide vital links to other parts of the country.

### Airport Shuttle and Taxi Service

Several options are available for transportation from the airport into Salt Lake City. These include taxi and private or hotel-based shuttle service.

Taxi service is available at the airport for approximately \$22.00 each way.

Xpress Shuttle operates 24 hours a day and has a desk in each terminal near the baggage claim area. Reservations are required 24 hours in advance and may be made via phone, 800-397-0773, or online at <http://www.expressshuttleutah.com>. Rates are approximately \$8.00 each way. A one dollar discount, each way, is offered to OSM attendees if they mention "Ocean Sciences Meeting" when making their reservations.

The following hotels offer complimentary shuttle to and from the airport:

- Crystal Inn, 24 hours
- Red Lion, 5am - 1am
- Salt Lake Plaza Hotel, 6:30 am – 11 pm
- Shilo Inn, 24 hours

## Light Rail System

With several light-rail stops in the convention/hotel district, attendees will find it easy to get around Salt Lake City. Whether heading a couple blocks to the Gateway Center for shopping and entertainment, or historic attractions around downtown, the light rail system is quick, easy and free of charge within the downtown area!

## Car Rentals

Be sure to book your car rental early. While we have tried to make sure that there will be enough rental cars available during our meeting, they are in demand this time of year, especially SUVs.

Avis is the official car rental company for this meeting and will extend discounted rates for those attending the meeting. Discounted rates will be available from 13 February to 2 March 2012. You must use the Avis Worldwide Discount (AWD) number of D130903 to receive the discount rates. Reservations may be made by telephone, 800-230-4898, or online at [https://www.avis.com/AvisWeb/reservation/ReservationsInitializer?&AWD\\_NUMBER=D130903](https://www.avis.com/AvisWeb/reservation/ReservationsInitializer?&AWD_NUMBER=D130903)

## Registration Information

Online registration is preferred and highly recommended. You can register electronically on the conference web site (<http://www.sgmeet.com/osm2012>). Electronic registrations must include complete credit card information. Member rates for registration are available to members of any of the sponsoring societies.

Transactions are protected and encrypted using a secure socket layer (SSL) certificate provided by Verisign, Inc.

However, meeting organizers assume no liability for your credit card information when it is transmitted electronically. All credit card transactions will be processed through the conference web site. SSL technology is the industry-standard method for protecting web communications. The SSL security protocol provides data encryption, server authentication, message integrity, and optional client authentication for a TCP/IP (internet) connection. Credit card verification and debit services will be provided by Authorize.net, a leading provider of Internet-based transaction services.

If registration by electronic means is not possible, please complete the registration form and send to the address listed below with payment or charge card information. Please return mailed-in registrations to:

2012 Ocean Sciences Meeting  
5400 Bosque Boulevard, Suite 680  
Waco, Texas 76710-4446

Please make checks payable to: OSM (All payments must be in U.S. dollars drawn on a U.S. bank.)

Registrations complete with purchase order, or credit card information not accompanying an abstract submission, can be faxed to: 254-776-3767 or via email to: [lyndaw@sgmeet.com](mailto:lyndaw@sgmeet.com).

The full registration fee includes admission to all sessions, exhibits, evening town halls and workshops (unless otherwise specified), Sunday welcome reception and poster receptions, coffee breaks, and the program book. Optional events such as any special organized activities are not included. Abstracts will be available on line.

## Substitutions or Cancellations

We understand that occasionally other responsibilities and personal obligations prevent you from attending a program for which you have registered. If you find that you will not be able to attend the meeting, we encourage you to send a substitute. Substitutions can be made at any time, even on-site at the conference.

If you find it necessary to cancel after you have already paid, we can refund your conference fee (less a \$70.00 USD processing fee) if we receive notice in writing on or before 20 January 2012. Registrants who cancel on or after 20 January 2012 will be not be eligible for any part of a refund. Abstract submission fees are non-refundable.

To provide cancellation notice and request a refund, please send a letter to: Lynda West, 5400 Bosque Boulevard, Suite 680, Waco, Texas 76710-4446 Phone: 254-399-9635, Fax: 254-776-3767, E-mail: [lyndaw@sgmeet.com](mailto:lyndaw@sgmeet.com).

## Non-Refundable Fees for Duplicate Submissions and Abstract Changes

Duplicate abstract submissions and/or registrations will be charged a non-refundable processing fee of \$60 USD for professionals and \$30 USD for students to cover the costs associated with processing. If submitting electronically, DO NOT submit mailed-in hard copies as well.

Also, any author who submits an abstract by mail and then resubmits the same abstract with revisions or changes or sends in a request for the appropriate changes to be made will be charged an abstract change fee of \$60 USD for professionals and \$30 USD for students.

## Registration Fees

Fees are stated in U.S. dollars and must be paid in U.S. dollars.

### Society Members:

- \$390.00 USD on or before 19 January 2012
- \$490.00 USD 20 January – 18 February 2012
- \$550.00 USD On-site

### Non-Members:

- \$490.00 USD on or before 19 January 2012
- \$590.00 USD 20 January – 18 February 2012
- \$650.00 USD On-site

### Society Student Members:

- \$290.00 USD on or before 19 January 2012
- \$390.00 USD 20 January – 18 February 2012
- \$450.00 USD On-site

### Non-Member Students:

- \$350.00 USD on or before 19 January 2012
- \$450.00 USD 20 January – 18 February 2012
- \$500.00 USD On-site

### Early Career:

- \$300.00 USD on or before 19 January 2012
- \$400.00 USD 20 January – 18 February 2012
- \$450.00 USD On-site

**Emeritus/Retiree:**

- \$195.00 USD on or before 19 January 2012
- \$295.00 USD 20 January – 18 February 2012
- \$350.00 USD On-site

**Non-Developed Country Registration:**

- \$200.00 USD

**High School Students or High School Teachers**

- \$150.00 USD

**One-day Registrations (may only register for one day):**

- \$300.00 USD Member
- \$400.00 USD Non-Member
- \$200.00 USD Student Member or Early Career
- \$280.00 USD Student Non-Member
- \$100.00 USD High School Student or High School Teacher, Non-Developed Country, Emeritus or Retiree

**Guest/Social:**

- \$150.00 USD (Spouse and guest fees cover only the conference social events such as the Sunday welcome reception, coffee services, and the poster receptions. Optional events such as any special activities are not included. However, spouses and guests are encouraged to register for the special activities. Spouses and guests cannot be admitted to the sessions without paying the appropriate full registration fee.)

**Abstract Fee (Required for registrations accompanied by an abstract submittal.)**

- \$60.00 Professional
- \$30.00 Student

**Exhibitor:**

- \$1500.00 Commercial
- \$750.00 Government Agency
- \$500.00 Non-Profit

Fees to attend the meeting must be paid in advance. Registrations are not considered guaranteed until credit card information, check, money order or purchase order information is received. All fax registrations must include complete credit card information, including number, expiration date, and cardholder name. VISA, MasterCard, and American Express are accepted. Organizations can be billed only if a purchase order accompanies the registration either by fax or by mail.

## Special Needs

If you have a disability or limitation that may require special consideration in order to fully participate, please contact the OSM Business Office to see how we can accommodate your needs. Call 254-776-3550 or contact via e-mail at [helens@sgmeet.com](mailto:helens@sgmeet.com)

## Child Care Information

While you are attending the Ocean Sciences Meeting, your children can enjoy their own convention camp organized by ACCENT

on Children's Arrangements, Inc., a national company specializing in children's activities. ACCENT has a proven record within this scientific community, having provided child care services during previous society meetings. The program provides complete morning-to-early-evening entertainment packed with activities for children ages six months to 12 years. Children will participate in age-appropriate activities, including arts and crafts projects and active games in a safe, nurturing, and educational environment. The high ratio of caregiver to child (1:2 for children six to 12 months; 1:3 for children 13 months to two years; 1:5 for children three to five years; and 1:8 for children six to 12 years) ensures that campers receive personal attention.

Arrangements need to be made on an individual basis through ACCENT on Arrangements, Inc. by completing the registration form online at <http://www.accentregister.com/register/camposm12>. You also can call ACCENT on Children's Arrangements at 504-524-0188 or email: [registration@accentoca.com](mailto:registration@accentoca.com).

The meeting organizers assume no responsibility or liability for services rendered.

The meeting sponsors support parents and understand it is difficult and expensive to make daycare arrangements. A portion of the daycare costs is being subsidized by the conference. ASLO also offers daycare grants to parents who are members of ASLO. Please complete the designated form. ASLO will notify you following the acceptance of abstracts if you will receive a grant.

## Hotel and Accommodation Information

Eleven (11) hotels have been selected, all within walking distance to the Salt Palace Convention Center, the site for 2012 Ocean Sciences Meeting. There is also a complimentary trolley service (TRAX) that runs from nearby hotels to the convention center. These hotels provide a range of sleeping room rates. (Refer to the map for the location of these hotels.) Please make your hotel reservations by contacting the hotel directly via phone, fax, or e-mail.

Staying at one of the following hotels helps support the conference and allows the societies to maintain the lowest cost possible for the meeting.

### Hilton Salt Lake City Center

255 S. West Temple  
Salt Lake City, Utah 84101  
Telephone: 801.328.2000  
Fax: 801.359.2938  
Rate: \$169.00 single/double  
Cut-Off: January 23, 2012  
Reservations: 1.800.HILTONS

The Hilton is located in downtown Salt Lake City, 8 miles from the Salt Lake International Airport, the nearest major hotel to the South Lobby entrance of the Salt Palace Convention Center. The best of the city is within walking distance: excellent restaurants, clubs and bars, the Gateway outdoor shopping district, the art space district with unique coffee shops and galleries, Pierpont Avenue, Capitol Theater, and Abravanel Hall, home to the Utah Symphony.

# Meeting Hotel Map



- |   |  |
|---|--|
| 1. Hilton Salt Lake City Center               | 7. Marriott Salt Lake City Center          |
| 2. Hotel Monaco                               | 8. Marriott Salt Lake City Downtown        |
| 3. Red Lion Hotel Salt Lake Downtown          | 9. Little America Hotel                    |
| 4. Hampton Inn – Downtown                     | 10. Radisson Hotel Salt Lake City Downtown |
| 5. Crystal Inn Downtown                       | 11. Shilo Inn Hotel                        |
| 6. The Salt Lake Plaza Hotel at Temple Square |  |

## Salt Lake City Marriott Downtown

75 South West Temple  
Salt Lake City, UT 84101  
Telephone: 801-531-0800  
Fax: 801-532-4127  
Rate: \$129.00 single/double  
Cut-Off: January 23, 2012  
Reservations: 1-800-228-9290

The Salt Lake City Marriott Downtown is a luxury hotel located in the heart of the city and features scenic views of the area skyline with easy access to all of the exciting activities in Salt Lake City. The hotel is situated just steps away from the historic LDS Temple Square, Symphony Hall, and the Salt Palace Convention Center.

## Little America Hotel

500 South Main Street  
Salt Lake City, Utah 84101  
Telephone: 801-596-5700  
Reservations: 800-281-7899  
Fax: 801-596-5911  
Rate: \$117 Courtyard single/ \$128 Courtyard dbl/ \$145 Garden single/\$156 Garden dbl  
Cut-Off: January 23, 2012

Little America Hotel is conveniently located on 10 acres in the heart of downtown Salt Lake City, just 10 minutes from the Salt Lake International Airport. Little America is within walking distance from shopping, restaurants, cultural and sporting events and is roughly 30-40 minutes from the major ski resorts. Other nearby attractions includes historic Temple Square, the world-famous Great Salt Lake and national parks, forests, and monuments.

## Hotel Monaco Salt Lake City

15 West 200 South  
Salt Lake City, UT 84101  
Reservations (800) 805.1801  
Hotel: (801)595.0000  
Fax: (801) 532.8500  
Rate: \$179.00 single/double  
Cut-Off: January 23, 2012

The Hotel Monaco Salt Lake City is set in a meticulously refurbished historic landmark building and provides guests some of the most hospitable, stylish accommodations among Salt Lake City boutique hotels. Hotel Monaco's newly renovated 225 boldly eclectic guestrooms welcome you with oversized beds and marble-accented bathrooms.

## Salt Lake Marriott City Center

220 South State Street  
Salt Lake City, Utah  
Phone: (801) 961-8700 or 866-961-8700, Fax: (801) 961-8704  
Online Reservations: <https://www.marriott.com/slccc>  
Room Rate: \$149.00 single/double  
Cut-Off: January 23, 2012

The Salt Lake Marriott City Center is located two blocks from the

Salt Palace Convention Center in the heart of downtown. The hotel is within walking distance of several restaurants and bars. As a AAA four diamond hotel, guests experience award winning quality and service. Complimentary amenities include wireless Internet in our guestrooms and public areas, business center, fitness center and pool.

## Salt Lake Plaza Hotel

122 West South Temple  
Salt Lake City, UT 84101  
Phone: 801-521-0130 Toll Free: 800-366-3684 Fax: 801-322-5057  
Hotel website: [www.plaza-hotel.com](http://www.plaza-hotel.com)  
Room Rates: \$120.00 single/double  
Cut-off: January 23, 2012

The Salt Lake Plaza Hotel offers prime location for the convention attendees and is located just across the street from the Salt Palace Convention Center. We provide complimentary airport shuttle and complimentary wireless hi-speed internet access throughout the building.

## Shilo Inn Hotel

206 S West Temple  
Salt Lake City, UT 84101  
Phone: (801)521-9500, Fax: (801)359-6527  
Hotel website: [www.shiloinns.com](http://www.shiloinns.com)  
Rate: \$119.00 single/double, \$129 triple/quad  
Cut-Off: January 23, 2012

Shilo Inns Suites Hotel is located in the heart of Salt Lake City. The hotel is directly across the street from the Salt Palace Convention Complex and within easy walking distance to the many various attractions including historical landmarks and shopping centers, local authentic restaurants and the Utah Transit Train Stations. The hotel is completely non-smoking.

A complimentary American breakfast, complimentary shuttle service to and from the airport and free parking are also provided. There is a 24-hour pool, hot tub and fitness center, as well as a 24-hour business center. Free high-speed wireless internet is available in each of the rooms. Every guest room has a microwave and mini refrigerator along with a coffee pot.

## Radisson Hotel Salt Lake City Downtown

215 West South Temple, Salt lake City, UT 84101  
Reservations: 1-800-395-7046 US/Canada Toll-Free  
Telephone: (801) 531-7500  
Fax: (801) 328-1289  
Rate: \$159.00 single/\$169 double/\$\$179 triple/\$189 quad  
Cut-Off: January 23, 2012

The Radisson Hotel Salt Lake City Downtown (located 30 feet from the Salt Palace Convention door) features exceptional guest rooms and facilities and comfortable Sleep Number® beds. Located in the heart of downtown, guests enjoy the convenient location near historic Temple Square, shopping, dining (52 restaurants within walking distance), ski resorts, Salt Lake City International Airport and the Salt Palace Convention Center. The hotel features a state-of-the-art fitness facility, free Wi-Fi, concierge service, indoor pool, whirlpool and sauna. Valet or underground parking is available at a nominal fee.

## Red Lion Hotel Salt Lake Downtown

161 West 600 South  
 Salt Lake City, UT 84101  
 Phone: 801-521-7373 Fax: 801-524-0354  
 Reservations Hotline: 800-325-4000  
 Hotel website: [www.saltlakecityredlion.com](http://www.saltlakecityredlion.com)  
 Rate: \$135.00 single/double), \$145.00 triple/quad  
 Cut-off: January 23, 2012

The Red Lion is a full-service high rise hotel located near the Salt Palace Convention Center and other area attractions. The hotel offers complimentary high-speed wireless connectivity (throughout the property), free parking as well as free airport shuttle service.

## The Crystal Inn Hotel & Suites

230 West 500 South  
 Salt Lake City, Utah 84101  
 Phone: 800-366-4466 or 801-328-4466  
 Fax: 801-328-4072  
 Hotel website: <http://www.crystalinns.com>  
 Rate: \$129.00 single/double  
 Cut-Off: January 23, 2012

The Crystal Inn Hotel & Suites in downtown Salt Lake City offers an extremely convenient location. In the heart of the downtown area, the hotel is only 3 blocks from the Salt Palace Convention Center. There are ample dining and shopping opportunities within walking distance. Accommodations include a complimentary hot breakfast buffet, round-trip airport shuttles, high-speed wireless Internet access in all rooms, cable television, parking and local phone calls.

Hotel amenities include an indoor heated pool, hot tub, dry sauna, fitness center, convenience store and business center. Each room includes a separate living area, 32" flat screen TV, a mini-refrigerator, microwave, coffee and coffee maker, iron/ironing board, hairdryer, guest laundry facilities, dry cleaning service and 24-hour Front Desk service.

## Hampton Inn—Salt Lake City, Downtown

425 South 300 West  
 Salt Lake City, UT 84101  
 Phone: 801-741-1110 Fax: 801-741-1171  
 Phone Reservations: 800-HAMPTON (800-426-7866)  
 Hotel website: [www.saltlakecitydowntown.hamptoninn.com](http://www.saltlakecitydowntown.hamptoninn.com)  
 Rates: \$154.00 single/double  
 Cut-off date: January 23, 2012

The Hampton Inn—Salt Lake City is conveniently located in downtown Salt Lake City, just four blocks from the Salt Palace Convention Center. All rooms include complimentary hot breakfast buffet, free high speed wireless internet access and free parking. The hotel has an exercise facility, indoor pool and hot tub.

## For More Information

For more information on the 2012 Ocean Sciences Meeting, address all correspondence and questions regarding registration, conference logistics, and hotel accommodations to:

Sue Rulla  
 2012 Ocean Sciences Meeting  
 5400 Bosque Boulevard, Suite 680  
 Waco, Texas 76710-4446  
 Phone: 254-776-3550  
 Fax: 254-776-3767  
 E-mail: [suer@sgmeet.com](mailto:suer@sgmeet.com)

If your questions pertain to the program, please contact one of the meeting chairs. If you need information regarding content of a particular session, please contact the appropriate session organizer.

# 2012 Ocean Sciences Meeting Registration Form

If you are unable to register electronically on the web at <http://www.sgmeet.com/osm2012>, please mail completed registration form and payment to: 2012 Ocean Sciences Meeting, 5400 Bosque Blvd, Suite 680, Waco, Texas 76710-4446, USA. Registrations complete with purchase order or credit card information that are not accompanying an abstract submission can be faxed to: 254-776-3767.

Please make checks payable in U.S. dollars and drawn on a U.S. bank to: OSM. Please print or type.

LAST NAME	FIRST NAME	MIDDLE INITIAL
NAME FOR BADGE		
INSTITUTE OR ORGANIZATION		
DEPARTMENT OR FIRST ADDRESS LINE		
SECOND ADDRESS LINE		
CITY	STATE/PROVINCE	ZIP
COUNTRY		
E-MAIL	PHONE	FAX

### Membership Status:

Select all that apply. I am a member of:  TOS  AGU  ASLO

### Participation:

- |  |  |
|--|--|
| <input type="checkbox"/> I need a Letter of Invitation to apply for a visa to enter the United States. | <input type="checkbox"/> I am willing to be listed as a resource for the media.        |
| <input type="checkbox"/> I am a post-doc student or professional willing to serve as a poster judge.   | <input type="checkbox"/> I am a graduate student and willing to mentor undergraduates. |
| <input type="checkbox"/> I am an undergraduate student and would like to be mentored.                  | <input type="checkbox"/> I am a student and interested in being a "volunteer."         |

### Fees (in U.S. dollars and per person):

<input type="checkbox"/> Society Members.....	<input type="checkbox"/> On or before 19 Jan 2012: \$390	<input type="checkbox"/> between 20 Jan–18 Feb 2012: \$490	<input type="checkbox"/> On-site: \$550	_____
<input type="checkbox"/> Non-Members .....	<input type="checkbox"/> On or before 19 Jan 2012: \$490	<input type="checkbox"/> between 20 Jan–18 Feb 2012: \$590	<input type="checkbox"/> On-site: \$650	_____
<input type="checkbox"/> Emeritus/Retiree.....	<input type="checkbox"/> On or before 19 Jan 2012: \$195	<input type="checkbox"/> between 20 Jan–18 Feb 2012: \$295	<input type="checkbox"/> On-site: \$350	_____
<input type="checkbox"/> Early Career.....	<input type="checkbox"/> On or before 19 Jan 2012: \$300	<input type="checkbox"/> between 20 Jan–18 Feb 2012: \$400	<input type="checkbox"/> On-site: \$450	_____
<input type="checkbox"/> Member Students.....	<input type="checkbox"/> On or before 19 Jan 2012: \$290	<input type="checkbox"/> between 20 Jan–18 Feb 2012: \$390	<input type="checkbox"/> On-site: \$450	_____
<input type="checkbox"/> Non-Member Students.....	<input type="checkbox"/> On or before 19 Jan 2012: \$350	<input type="checkbox"/> between 20 Jan–18 Feb 2012: \$450	<input type="checkbox"/> On-site: \$500	_____
<input type="checkbox"/> Guest/Social (Spouses/guests are not admitted to the sessions.).....				\$150.00 _____
Spouse/Guest Name: _____				
<input type="checkbox"/> One-Day Registrations (One day only please: <input type="checkbox"/> Mon 20 Feb <input type="checkbox"/> Tue, 21 Feb <input type="checkbox"/> Wed 22 Feb <input type="checkbox"/> Thu, 23 Feb <input type="checkbox"/> Fri, 24 Feb).....	_____			
<input type="checkbox"/> Member: \$300 <input type="checkbox"/> Non-member: \$400 <input type="checkbox"/> Emeritus-Retiree: \$100 <input type="checkbox"/> Early Career: \$200 <input type="checkbox"/> Member Student: \$200 <input type="checkbox"/> Non-member Student: \$280 <input type="checkbox"/> H.S. Student, H.S. Teacher or Non-developed Country: \$100				
<input type="checkbox"/> Non-developed Country .....	\$200.00 _____			
<input type="checkbox"/> High School Student or High School Teacher .....	\$150.00 _____			
<input type="checkbox"/> Abstract Fee (Required for registrations accompanied by an abstract submittal.)				
<input type="checkbox"/> Professional.....				\$60.00 _____
<input type="checkbox"/> Student.....				\$30.00 _____
<b>Total in U.S. Dollars</b>				_____

### Payment:

- Amount Enclosed
- Bill My Organization. (You must submit a purchase order.)
- Credit Card Payment
- Visa     MasterCard     American Express

NAME ON CARD

CARD NUMBER

EXP. DATE

SIGNATURE

### Confirmation:

A confirmation will be sent to your e-mail address unless specified.  
 I prefer that my registration confirmation by:  Fax  Mail

### Special Needs:

If you have a disability or limitation that may require special consideration in order to fully participate, contact the meeting's planning organization to see how we can accommodate your needs. Call 254-399-9635 or contact via e-mail at [osm2012@sgmeet.com](mailto:osm2012@sgmeet.com)

### Room Sharing:

- I am interested in sharing a hotel room to defray costs.



# 2012 Ocean Sciences Meeting Abstract Submission Form

The abstract submission deadline is 7 October 2011. (All Internet and mailed submissions must be received by this date. Mailed submissions should be sent in advance so that they are received, not postmarked, by this date.)

To submit your abstract electronically, please point your forms-capable web browser to <http://www.sgmeet.com/osm2012/>. Stated guidelines and procedures as stated in the Call for Papers must be followed exactly. If not, your paper will not be accepted. Submit the abstract on a CDROM accompanied by one (1) original hard copy printed on white paper. All documents must be submitted in Microsoft Word format. Abstracts submitted in any other format are not acceptable and will be returned. CDs must be clearly and fully labeled with the name of the author to contact, institution name, mailing address, phone number, and e-mail address. CD submissions must include a hard copy of the abstract, no exceptions. E-mail and fax copies of abstracts are not acceptable.

You may not submit the form in this brochure if you choose to submit via the Internet.

Author to Contact: (Only one abstract per first author will be accepted.)

LAST NAME	FIRST NAME	MIDDLE INITIAL
INSTITUTE OR ORGANIZATION		
DEPARTMENT OR FIRST ADDRESS LINE		
LAST ADDRESS LINE		
CITY	STATE/PROVINCE	ZIP
COUNTRY		
E-MAIL	PHONE	FAX

### Presentation Preference:

- Oral       Poster

Session Topic Code (Please reference listing in this brochure.):

Choice 1: \_\_\_\_\_

If "Other," please indicate keywords: \_\_\_\_\_

\_\_\_\_\_

- I am willing to serve as a session chair.  
 I would like my presentation considered for local media.

### Confirmation of Acceptance:

You will be notified of acceptance by e-mail unless otherwise noted here. Please notify me by  Mail  Fax

### Student Travel Grant

- I am applying for a Student Travel Award. I have completed the registration, abstract submission, and student travel award forms. Students from TOS, AGU and ASLO are eligible.

### ASLO Early Career Travel Grant

- I am applying for an Early Career Travel Award. I have completed the registration, abstract submission, and early career travel award forms. Only ASLO Early Career members are eligible.

### Additional Audio-Visual Requirements:

Computer projection equipment, LCD, projector, computer, and a screen will be provided. Please indicate below if you need additional equipment.

- Other (List any additional audio-visual equipment that you consider necessary for your presentation. Please note that any special requests for audio-visual (i.e. rental of VCR, monitor, 35mm slide projector, audio systems, computers, provision of additional power outlets, tables, stands, etc. ) should be made when the abstract is submitted. Any costs for these additional items will be billed to the author on this form.):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

In order to be considered as complete, the registration form, full registration fee and abstract submittal fee must accompany the abstract form. Mail the completed abstract submission form, completed registration form, payment of fees, CD, and one (1) copy of the abstract to:

2012 Ocean Sciences Meeting  
 5400 Bosque Boulevard, Suite 680  
 Waco, Texas 76710-4446, USA



# 2012 Ocean Sciences Meeting Student Travel Award Application

Please print or type.

\_\_\_\_\_  
LAST NAME FIRST NAME MIDDLE INITIAL

\_\_\_\_\_  
INSTITUTE OR ORGANIZATION

\_\_\_\_\_  
DEPARTMENT OR FIRST ADDRESS LINE

\_\_\_\_\_  
LAST ADDRESS LINE

\_\_\_\_\_  
CITY STATE/PROVINCE ZIP COUNTRY

\_\_\_\_\_  
E-MAIL DAYTIME PHONE (INCLUDE COUNTRY CODE) FAX

\_\_\_\_\_  
TYPE OF DEGREE SOUGHT EXPECTED DATE OF COMPLETION

\_\_\_\_\_  
TITLE OF PAPER

\_\_\_\_\_  
FACTORY ADVISOR: NAME, PHONE NUMBER, FAX NUMBER

\_\_\_\_\_  
FACTORY ADVISOR: E-MAIL ADDRESS

- Yes  No I am a full-time student and member of TOS, AGU, or ASLO
- Yes  No I have previously received a student travel award from one of the sponsoring societies.
- Yes  No I have attended an Ocean Sciences Meeting in the past.

\_\_\_\_\_  
STUDENT'S SIGNATURE DATE

**Please complete this form and attach the following to this application:**

1. Abstract of paper according to specifications on the abstract form
2. Copy of completed abstract submission form
3. Registration form
4. Payment of the student registration fee

**Important Dates to Remember**

- Abstract Submittal Deadline ..... 7 October 2011
- Authors Notified ..... December 2011
- Student Travel Grant Recipients Notified ..... December 2011
- Meeting Schedule Posted on Web Site ..... January 2012
- Ocean Sciences Meeting ..... 20-14 February 2012

## 2012 Ocean Sciences Meeting ASLO Early Career Travel Grant Application

Early career travel grants are awarded by ASLO. Only ASLO members may apply. Please print or type.

LAST NAME		FIRST NAME	MIDDLE INITIAL
INSTITUTE OR ORGANIZATION			
DEPARTMENT OR FIRST ADDRESS LINE			
LAST ADDRESS LINE			
CITY	STATE/PROVINCE	ZIP	COUNTRY
E-MAIL	DAYTIME PHONE (INCLUDE COUNTRY CODE)		FAX
CURRENT POSITION		EMPLOYER (IF DIFFERENT FROM ABOVE)	
TITLE OF PAPER			
<input type="checkbox"/> Yes <input type="checkbox"/> No I am a member of ASLO.			
<input type="checkbox"/> Yes <input type="checkbox"/> No I have attended an ASLO meeting in the past.			
APPLICANT SIGNATURE		DATE	

### Please complete this form and attach the following to this application:

1. Abstract of paper according to specifications on the abstract form
2. Copy of completed abstract submission form
3. Registration form
4. Payment of the student registration fee
5. Brief paragraph describing your current funding situation and your need for funding to attend this meeting

### Important Dates to Remember

Abstract Submittal Deadline ..... 7 October 2011  
 Authors Notified ..... December 2011  
 Student Travel Grant Recipients Notified ..... December 2011  
 Meeting Schedule Posted on Web Site ..... January 2012  
 Ocean Sciences Meeting ..... 20-14 February 2012

# 2012 Ocean Sciences Meeting Exhibitor Registration Form

This form will reserve exhibit space at the 2012 Ocean Sciences Meeting and will become a binding contract upon completion and submission of this form.

**EXHIBIT SPACE RENTAL FEE:** The rental fee for exhibit space is \$1,500 USD for commercial (for-profit) companies, \$750.00 for Government organizations and \$500 USD for nonprofit organizations per each booth space. The rental fee includes one (1) booth, identification signage, one 6-foot table and two chairs, a listing within the "Exhibitors" section of the printed meeting program and participation in the opening reception and poster session receptions associated with this meeting.

**PAYMENT OF FEE:** Full payment of the appropriate fee must be submitted with this application. Please make checks payable to OSM. Return this completed form with payment to 2012 Ocean Sciences Meeting, 5400 Bosque Blvd., Suite 680, Waco, Texas 76710-4446, USA.

Please print or type.

\_\_\_\_\_  
COMPANY/INSTITUTE/ORGANIZATION

\_\_\_\_\_  
CONTACT NAME

\_\_\_\_\_  
POSITION

\_\_\_\_\_  
FIRST ADDRESS LINE

\_\_\_\_\_  
SECOND ADDRESS LINE

\_\_\_\_\_  
CITY

\_\_\_\_\_  
STATE/PROVINCE

\_\_\_\_\_  
ZIP

\_\_\_\_\_  
COUNTRY

\_\_\_\_\_  
PHONE

\_\_\_\_\_  
FAX

\_\_\_\_\_  
E-MAIL

\_\_\_\_\_  
URL/WEB ADDRESS

Your booth sign should read:

\_\_\_\_\_

For meeting badges, please list the full name of up to four colleagues/co-workers who will be working in your exhibit space:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Exhibition Fees (in U.S. dollars):

Commercial Exhibit Spaces ..... # of spaces @\$1500.00 USD per space = \_\_\_\_\_

Government Exhibit Spaces ..... # of spaces @\$750.00 USD per space = \_\_\_\_\_

Nonprofit Exhibit Spaces ..... # of spaces @\$500.00 USD per space = \_\_\_\_\_

**Total in U.S. Dollars** \_\_\_\_\_

### Payment:

- Check Enclosed.
- Bill My Organization. (You must submit a purchase order.)
- Credit Card Payment:
  - Visa     MasterCard     American Express

### Special Needs:

If you, your guests or co-workers have a disability or limitation that may require special consideration in order to fully participate, please contact the meeting's planning organization to see how we can accommodate your needs. Call 1-800-929-2756 (USA, Canada & Caribbean) or 254-399-9635 (All other countries) or contact via e-mail at [osm2012@sgmeet.com](mailto:osm2012@sgmeet.com).

\_\_\_\_\_  
NAME ON CARD

\_\_\_\_\_  
CARD NUMBER

\_\_\_\_\_  
EXP. DATE

\_\_\_\_\_  
SIGNATURE

## 2012 Camp OSM – ASLO Child Care Grant Request Form

Arrangements need to be made on an individual basis through ACCENT on Children's Arrangements, Inc. by completing the registration form online at <http://www.accentregister.com/register/camposm12>. You also can call ACCENT on Children's Arrangements at 504-524-0188 or email: [registration@accentoca.com](mailto:registration@accentoca.com).

ASLO offers daycare grants to parents who are members of ASLO and are registered for the meeting. Please complete the following information for initial interest in child care. ASLO will notify you following the acceptance of abstracts if you will receive a grant. All grant payments will go directly to ACCENT on Children's Arrangements.

Parent:

\_\_\_\_\_  
LAST NAME

\_\_\_\_\_  
FIRST NAME

\_\_\_\_\_  
MIDDLE INITIAL

### Child and Day Care Needs:

Date	Full Day	Half Day AM	Half Day PM	# of Children	Ages
Monday, 20 February	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____
Tuesday, 21 February	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____
Wednesday, 22 February	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____
Thursday, 23 February	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____
Friday, 24 February	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____

Check here if your child has needs under the Americans with Disabilities Act.

Please mail or FAX to:

Sue Rulla  
 2012 Ocean Sciences Meeting  
 5400 Bosque Boulevard, Suite 680  
 Waco, Texas 76710-4446  
 Phone: 254-776-3550  
 Fax: 254-776-3767

For more information on the 2012 Ocean Sciences Meeting,  
address all correspondence and questions regarding registration,  
conference logistics, and hotel accommodations to:

**2012 Ocean Sciences Meeting**  
**5400 Bosque Boulevard, Suite 680**  
**Waco, Texas 76710-4446**  
**Phone: 254-776-3550**  
**Fax: 254-776-3767**

**<http://www.sgmeet.com/osm2012> Web**  
**[osm2012@sgmeet.com](mailto:osm2012@sgmeet.com) Email**