Grace Chang, Ph.D.
Senior Science Advisor

Education and Credentials

Ph.D., Marine Science, University of California, Santa Barbara, California, 1999

M.S., Mechanical and Environmental Engineering, University of California, Santa Barbara, California, 1997

B.G.E., Geological Engineering, University of Minnesota, Minneapolis, Minnesota, 1995

B.S., Geology, University of Minnesota, Minneapolis, Minnesota, 1995

Continuing Education and Training

Hazardous Waste Operations and Emergency Response 40-Hour Certification (2009)

Hazardous Waste Operations 8-Hour Refresher Certification (2012, 2014, 2015, 2016, 2017, 2018, 2019)

Professional Affiliations

Member of American Geophysical Union

Member of The Oceanography Society

Member of American Energy Society

Professional Profile

Dr. Grace Chang is a consultant in limnology and oceanography. She has more than 25 years of experience performing site assessments, including hydrodynamics, sediment transport, particle dynamics, and marine and hydrokinetic energy. Dr. Chang has managed programs involving field operations, data processing and analysis, and numerical modeling for environmental characterization, observational monitoring, scientific research, and technology development. She is recognized for her continued advancement of analytical methods in hydrodynamics and particle characterization through optics and acoustics, as well as for environmental research and monitoring. Dr. Chang has more than 40 peer-reviewed publications and frequently is invited to review materials for professional journals and national funding agencies.

Relevant Experience

Hydrodynamics and Sediment Transport

Berry's Creek Study Area, Sediment and Contaminant Transport Investigation, New Jersey—Obtained field measurements and performed data analysis for development of a quantitative description of the hydrodynamics and sediment transport in the system, in support of risk analysis and remedial selection and design. Calculated site-wide sediment flux and solids mass balance using measurements of currents and sediment concentration derived from acoustical and optical measurements. Developed a suite of instrumentation for measuring bottom shear stress and particle characteristics using acoustical and optical methods. Quantified continuous time series of concentrations of contaminants of potential concern using a novel optical model and field measurements. Participated in client and agency meetings to explain methodologies and results.

Optically-Based Monitoring of Surface Waters for a Superfund Site—Deploying and maintaining hydrodynamics and sediment transport, and OPTICS (OPTically-based *In situ* Characterization System) monitoring systems to support baseline monitoring and evaluation of the efficacy of monitored natural recovery. Quantifying solids concentration and transport, and concentrations and fluxes of PCBs from near-continuous, *in situ* measurements of optical and physical properties.

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Pilot Testing of Optically Based Monitoring of Mercury and Methyl Mercury in the South River, Virginia—Deployed multiple optically based sensors, along with ancillary water quality sensors, to collected synchronous data that are associated with chemicals in surface water (e.g., organic carbon, suspended solids). Correlated comprehensive optical and water quality measurements to analytically derived discrete chemical data. Calibrated a statistical model to reliably predict chemical concentrations over time and support a detailed characterization of system dynamics.

Lower Passaic River Restoration Project, Modeling Support Activities, New Jersey—As project manager, quantified sediment concentration and flux through acoustical and optical measurements, in support of sediment transport modeling activities and river restoration. Computed sediment concentrations and fluxes from acoustical signals. Related sediment movement to riverine and estuarine physical processes through advanced statistical methods. Results from wavelet analysis were presented at professional conferences, including one invited oral presentation.

Lower Passaic River Water Column Monitoring for Pre-design Investigation, New Jersey—Obtained real-time water quality and hydrodynamic measurements throughout the lower 8.3 miles of the Lower Passaic River to support remedial design. Water column data were used to develop a relationship between *in situ* data and chemical concentrations and to quantify suspended sediment concentration flux. Results will be used to establish baseline criteria and resuspension engineering performance standards for dredging and capping activities.

Evaluation of Environmental Dredging for Remediating Contaminated Sediments in the Ashtabula River, Ohio—Characterized the environmental dredge plume using moored and mobile field measurements. Mapped the extent of the dredge plume using a novel sediment gradient approach. Quantified the volume of the dredge plume and the total mass of dredge sediment released into the water column during dredging activities. Related sediment concentration to concentrations of contaminants of potential concern to estimate the mass of contaminants released during dredging.

Conceptual Site Model Delineation of In-Water Site Boundary, Port Angeles Harbor, Washington—Obtained hydrodynamic field measurements and performed numerical modeling to support contaminant fate and transport investigations. Conducted a literature review on currents and transport in the Port Angeles harbor region. Analyzed field measurements of currents to determine dominant transport directions. Executed a numerical wave model and validated results with measurements to assess the potential for sediment resuspension and transport during standard and extreme environmental conditions.

Sediment Transport Analysis at the United Heckathorn Superfund Site, Richmond, California—Developed a sediment transport conceptual site model from field and analytic results to address sediment management questions. Determined the magnitude and frequency of sediment resuspension and the magnitude and direction of sediment flux from analysis of field data.

Environmental Monitoring and Analysis in Support of Port of Bunbury Dredging Activities, Koombana Bay, Western Australia—As project manager, calculated water column suspended solids concentration from acoustical and optical measurements to establish background and

exceedance levels of total suspended solids concentration at monitoring and reference sites during Port of Bunbury Inner Harbour dredging activities. Reference sites, zone of influence, and zones of moderate and high impact were determined. Performed analysis of solids variability as related to physical forcing processes, in order to ascertain potential sources of elevated solids. Utilized a combined current and wave bottom shear stress model to help determine sediment stability of a proposed dredge material disposal site and validated the model with SEDflume laboratory results.

Contaminated Sediment Transport in the Kalamazoo River, Michigan—Characterized key regions of sediment deposition based on river characteristics, flow, and sediment loads along the Kalamazoo River, to assess sediment trapping efficiencies. Performed a review of previous evaluations of site hydrodynamics and sediment transport. Calculated flow rates and sediment loading throughout the site. Results were used to perform mass balance of sediment loads in impoundments along the river, to estimate trapping efficiencies. Estimated trapping efficiencies were compared to results from previous analytical and numerical assessments.

Marine Renewable Energy

Marine and Hydrokinetic Energy Market Acceleration and Deployment, Environmentally Focused—Performed numerical modeling of the effects of nearshore wave propagation in the lee of wave energy converter (WEC) arrays. Evaluated WEC-specific wave model function and operation. Performed sensitivity analyses of numerical wave models to offshore wave conditions, model parameters, and WEC characteristics. Executed wave models over various offshore wave conditions, for evaluation of nearshore wave propagation in the presence and absence of modeled WECs.

A Numerical Modeling Framework to Evaluate Effects of Offshore Wind Farms on the California Upwelling Ecosystem—As project manager, studying the effect of California offshore wind turbines on the wind stress field and upwelling circulation for a number of baseline (no wind farms) and modified (simulated wind farms) scenarios using highly resolved coupled numerical models (atmosphere-ocean circulation). Upwelling index metrics will be computed to quantify changes in upwelling resulting from offshore wind turbine deployment. Upwelling is a dominant driver of ecosystem productivity and variability in eastern boundary currents including the California Current System, which runs along the U.S. West Coast. Given the importance of upwelling in these regions, estimates of upwelling strength (i.e., upwelling indices) are critical for understanding fluctuations in ecosystem properties ranging from temperature and density all the way to distributions and abundances of top predators.

Overcoming WEC Grid Integration Challenges: Coupling Wave Forecasting, WEC Array Controls, and Power Production—Implementing machine-learning methods for optimization of wave data assimilation modeling to improve wave forecasting. Accurate wave forecasts will be integrated with WEC farm operational controls and energy storage systems to increase certainty in power forecasts. The "complete" power forecast will balance energy variability on grids for energy resiliency and security.

Improving the Efficiency and Effectiveness for Marine Hydrokinetic Permitting: A Toolkit and Engagement for Success—Increasing regulators' understanding of marine and hydrokinetic (MHK) projects, devices, and their potential environmental impacts while reducing permitting time and costs of MHK projects. Developing an easily accessible online toolkit that integrates relevant regulatory, scientific, and spatial MHK data. Working with Kearns & West, H.T. Harvey & Associates, EcoQuants, and others to conduct in-person meetings and webinars with relevant regulators from federal and state agencies to share and gather input on the toolkit and share experts' understanding of potential impacts and the state of known/unknown science for MHK projects.

Model Validation and Site Characterization for Early Development Marine Hydrokinetic Sites and Establishment of Wave Classification Scheme—Wave Instrumentation Deployment and Suspended Particle Characterization Measurements in Cook Inlet, Alaska—As project manager, assisting the U.S. government in making high-fidelity wave and tidal resource characterization measurements at potential wave and tidal energy sites. Managing field data collection of 12 months of high-quality wave resource and water column current data at three different deployment sites. Characterizing suspended particle load (particle concentration, size, and composition) at a potential tidal energy site to inform a regional circulation model and to enable industry to design devices best suited to resist the abrasive and intrusive stresses of suspended materials.

Rapidly Deployable Acoustic Monitoring and Localization System Based on a Low-Cost Wave Buoy Platform—Developing a cost-effective, compact array of acoustic vector sensors that characterizes, classifies, and provides accurate location information for anthropogenic and natural sounds in support of environmental monitoring technologies to evaluate the impact of marine and hydrokinetic energy devices. Managing the assessment and laboratory and field testing of acoustic monitoring technologies, design and engineering of underwater acoustic data logging and analysis systems, and development of algorithms to geolocate and characterize sources of sound.

Real-Time Wave Assessment Tool—As co-principal investigator, developed an ocean wave buoy capable of measuring and wirelessly relaying real-time wave data in support of the design, siting, and performance optimization of ocean energy conversion systems. Performed research on wave parameter measurements and calculations. Developed and tested algorithms for computation of wave height, period, and direction from high frequency global positioning system (GPS) data and accelerometer, gyroscope, and magnetometer data. Validated algorithms on a specially designed wave buoy validation stand. Completed several field data collection experiments. This project resulted in the commercialization of the Spotter wave measurement buoy.

Oceanography

Improved Observation and Parameterization of Bottom Boundary Layer Turbulence and Particle Properties, San Francisco Bay, California—As co-principal investigator, using novel acoustical and optical instrumentation and laboratory-based sediment experiments deployed in wave-driven estuarine waters of San Francisco Bay to directly observe relationships between physical dynamics and biogeochemical properties of suspended particles. The field and laboratory results will be used

to inform a large-eddy simulation model that resolves high-resolution variability of the turbulent, sediment-laden boundary layer. This work is funded by the National Science Foundation (NSF).

Nearshore Sound Propagation of and Species' Response to Active-Source Seismic Surveys, Offshore Oregon, United States—As co-principal investigator, measuring the particle motion component and pressure amplitude variations of the acoustic disturbance from seismic survey explosions along the Cascadia Subduction Zone. High-intensity acoustic pulse information will be correlated with behavioral responses of fishes and invertebrates in the Redfish Rocks Marine Reserve using acoustic telemetry, tracking, and acceleration of tagged animals. This project is funded by the NSF.

Adaptive Mapping of the Hypoxic Zone, Gulf of Mexico—Collaborated with Autonomous Surface Vehicles (ASV), LLC to develop enhanced autonomous hypoxia mapping capabilities for surface, subsurface, and near-bottom waters of the Gulf of Mexico and other water bodies affected by hypoxia. The results of this National Oceanic and Atmospheric Administration (NOAA) Small Business Innovation Research were transitioned to a NOAA Ocean Technology Transition (OTT) project to demonstrate an efficient and cost-effective method of monitoring hypoxic conditions. The NOAA OTT effort is being conducted in partnership with the University of Southern Mississippi, L3 Harris ASV, and the Gulf of Mexico Coastal Ocean Observing System (GCOOS).

Currents, Waves, and Suspended Sediment Monitoring, Baker Bay, Washington—As project manager, leading field activities to monitor water column and near-bed currents, surface waves, and water quality at seven different sites in Baker Bay, Washington, over a 6-week period. Long-term hydrodynamics and water quality measurements will enable the estimation of sediment accumulation in Baker Bay, as well as sediment shoaling in two important navigation channels, Ilwaco and Chinook Channels, to aid the U.S. Army Corps of Engineers in determination of dredging needs in the region.

Prediction of Optical Variability in Dynamic Nearshore Environments, Santa Cruz, California; Waimanalo, Hawaii; and Duck, North Carolina—As lead principal investigator, developed a system for forecasting marine optical conditions in the surf zone and nearshore coastal ocean using field measurements, analytical methods, and numerical modeling. Obtained field measurements of key physical and optical properties in three surf zone sites. Analyzed optical data to determine underwater visibility and probability of detection given site water depth. Related optical variability to physical forcing processes. Oversaw development and validation of wave and hydrodynamic models to predict optical variability from forecasted physical processes. Was lead author of a peer-reviewed publication presenting these results.

Radiance in a Dynamic Ocean (RaDyO): Radiance and Visibility as Affected by Inherent Optical Properties, and Imaging System Performance and Visibility as Affected by the Physical Environment, San Diego and Santa Barbara, California—Led and co-managed a team of principal investigators in an investigation of the sources of variability of optical properties for the interpretation of images from underwater electro-optical systems. Participated in two field experiments to obtain water column optical properties from stationary and mobile platforms, including the Research Platform FLoating Instrument Platform (RP FLIP). Determined sources of

variability of underwater visibility that included upper ocean mixing from wind forcing and stratification as well as eddy-induced phytoplankton blooms. Calculated the modulation transfer function and used advanced statistics to determine the relationship between physical and optical properties and imaging performance. Investigated the effects of stratification and scattering layers on imaging performance. Authored or co-authored three papers published in peer-reviewed journals.

Multidisciplinary Ocean Sensors for Environmental Analysis and Networks (MOSEAN), Hawaii and Santa Barbara, California—Acted as project manager to develop, test, and validate new sensors that are capable of sampling biological, chemical, and optical variables and demonstrated new interdisciplinary sensor suites for use with a variety of autonomous, unattended, stationary and mobile sampling platforms in coastal and deep ocean environments. Managed and participated in the development and operations of two real-time mooring platforms (one at a depth of more than 4,500 m and the other at 25 m) designed to test and validate newly engineered ocean sensors. Performed research on optical methods for characterizing particles, including sediment, phytoplankton, and harmful algal blooms. Was lead author on four papers published in peer-reviewed journals.

Southern California Coastal Ocean Observing System (SCCOOS): Shelf to Shoreline Observatory Development, Santa Barbara, California—As lead principal investigator and SCCOOS Mooring Working Group member, managed and participated in the development and operations of a real-time interdisciplinary mooring platform deployed in 80 m of water on a shelf break. Researched the delivery of nutrients, particles, and pollutants from offshore to the nearshore coastal ocean. Coordinated data collection with SCCOOS members from the University of California at Los Angeles and Scripps Institution of Oceanography.

Publications

Egan, G., G. Chang, S. McWilliams, G. Revelas, O. Fringer, and S. Monismith. 2020. Cohesive sediment erosion in a combined wave-current boundary layer. *J. Geophys. Res.* 126(2):e2020JC016655. doi: 10.1029/2020JC016655

Egan, G., A. Manning, G. Chang, O. Fringer, and S. Monismith. 2020. Sediment-induced stratification in an estuarine bottom boundary layer. *J. Geophys. Res.* 125(8):e2019JC016022. doi: 10.1029/2019JC016022

Egan, G., G. Chang, G. Revelas, S. Monismith, and O. Fringer. 2020. Bottom drag varies seasonally with biological roughness. *Geophys. Res. Lett*. 47, e2020GL088425. https://doi.org/10.1029/2020GL088425

Jones, C., G. Chang, J. Magalen, and J. Roberts. 2020. Validation of a hydrodynamics and sediment transport modeling framework for the evaluation of offshore wind farms. *Marine Technology Society Journal* 54(6):62–76.

Whiting, J.M., and G. Chang. 2020. Changes in oceanographic systems associated with marine renewable energy devices. pp. 127–145. In: OES-Environmental 2020 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World. A.E. Copping and L.G. Hemery (eds). Ocean Energy Systems.

Raghukumar, K., G. Chang, F. Spada, and C. Jones. 2020. A vector sensor-based acoustic characterization system for marine renewable energy. *J. Mar. Sci. Eng.* 8(3):187. doi:10.3390/jmse8030187.

Raghukumar, K., G. Chang, F.W. Spada, and C.A. Jones. 2019. NoiseSpotter: A rapidly deployable acoustic monitoring and localization system. D. Vicinanza et al. (eds), Proc. of the 13th European Wave and Tidal Energy Conference, Naples, Italy.

Raghukumar, K., G. Chang, F. Spada, C. Jones, J. Spence, S. Griffin, and J. Roberts. 2019. Performance characteristics of a vector sensor array in an energetic tidal channel. pp. 653–658. J.S. Papadakis (ed), Proc. of the Fifth Underwater Acoustics Conference and Exhibition, Crete, Greece.

Raghukumar, K., G. Chang, F. Spada, C. Jones, W. Gans, and T. Janssen. 2019. Performance characteristic of Spotter, a newly developed real-time wave measurement buoy. *J. Atmos. Ocean. Tech.* doi: 10.1175/JTECH-D-18-0151.1

Jones, C., G. Chang, A. Dallman, J. Roberts, K. Raghukumar, and S. McWilliams. 2019. Assessment of wave energy resources and factors affecting conversion. B. Carrier and D. Ball (eds), Offshore Technology Conference, Houston, TX. doi:10.4043/29570-MS

Raghukumar, K., S. McWilliams, G. Chang, J. Roberts, and C. Jones. 2019. Wave energy converter arrays: Optimizing power production while minimizing environmental effects. C. Jones and J. Chitwood (eds), Offshore Technology Conference, Houston, TX. doi:10.4043/29658-MS

Raghukumar, K., G. Chang, F.W. Spada, and C.A. Jones. 2019. Performance characteristics of the NoiseSpotter: An acoustic monitoring and localization system. A. Cooper and P. Gibbs (eds), Offshore Technology Conference, Houston, TX. doi:10.4043/29425-MS

Chang, G., and C. Jones. 2018. Towards low-cost, low-impact marine renewable energy. *Scientia.* https://doi.org/10.26320/SCIENTIA135.

Chang, G., T. Martin, K. Whitehead, C. Jones, and F. Spada. 2018. Optically based quantification of fluxes of mercury, methyl mercury, and polychlorinated biphenyls (PCBs) at Berry's Creek tidal estuary, New Jersey. *Limnol. Oceanogr.* doi: 10.1002/lno.11021

Chang, G., T. Martin, F. Spada, B. Sackmann, C. Jones, and K. Whitehead. 2018. OPTically-based In-situ Characterization System (OPTICS) to quantify concentrations and mass fluxes of mercury and methylmercury in South River, Virginia, USA. *River Research and Applications* 2018:1–10. doi: 10.1002/rra.3361

Chang, G., C.A. Jones, J.D. Roberts, and V. Neary. 2018. A comprehensive evaluation of factors affecting the levelized cost of wave energy conversion projects. *Renewable Energy* 127:344–354.

Jones, C., G. Chang, K. Raghukumar, S. McWilliams, A. Dallman, and J. Roberts. 2018. Spatial Environmental Assessment Tool (SEAT): A modeling tool to evaluate potential environmental risks associated with wave energy converter deployments. *Energies* 11, 2036, doi: 10.3390/en11082036.

Chang, G., K. Ruehl, C.A. Jones, J. Roberts, and C. Chartrand. 2016. Numerical modeling of the effects of wave energy converter characteristics on nearshore wave conditions. *Renewable Energy* 89:636–648.

Jones, C., G. Chang, and J. Roberts. 2015. Wave energy converter effects on wave, current, and sediment circulation: A coupled wave and hydrodynamic model of Santa Cruz, Monterey Bay, CA. Nichols, C.R. (ed), Proceedings of Ocean Waves Workshop, New Orleans, LA: University of New Orleans. Available online. URL: http://scholarworks.uno.edu/oceanwaves/2015.

Roberts, J., G. Chang, and C. Jones. 2015. Wave energy converter effects on nearshore wave propagation. Clement et al. (eds), Proceedings of the 11th European Wave and Tidal Energy Conference. Nantes, France.

Ruehl, K., A. Porter, C. Chartrand, H. Smith, G. Chang, and J. Roberts. 2015. Development, verification, and application of the SNL-SWAN open source wave farm code. Clement et al. (eds), Proceedings of the 11th European Wave and Tidal Energy Conference. Nantes, France.

Chang, G., C. Jones, and M. Twardowski. 2013. Prediction of optical variability in dynamic nearshore environments. *Meth. Oceanogr*. 7:63–78.

Dickey, T., M.L. Banner, P. Bhandari, T. Boyd, L. Carvalho, G. Chang, and 50 others. 2012. Introduction. In: Recent Advances in the Study of Optical Variability in the Near-Surface and Upper Ocean. *J. Geophys. Res*. 117:C00H20, doi: 10.1029/2012JC007964.

Chang, G., and M.S. Twardowski. 2011. Effects of physical forcing and particle characteristics on underwater imaging performance. *J. Geophys. Res*. 116:C00H03, doi: 10.1029/2011JC007098

Chang, G., M.S. Twardowski, Y. You, M. Moline, P.-W. Zhai, S. Freeman, M. Slivkoff, F. Nencioli, and G.W. Kattawar. 2010. Platform effects on optical variability and prediction of underwater visibility. *Appl. Opt*. 49(15):2784–2796.

Nencioli, F., G. Chang, M. Twardowski, and T.D. Dickey. 2010. Optical characterization of an eddy-induced diatom bloom west of the island of Hawaii. *Biogeosci.* 7:151–162.

Chang, G., and A.L. Whitmire. 2009. Effects of bulk particle characteristics on backscattering and optical closure. *Opt. Expr.* 17(4):2132–2142.

Dickey, T., N. Bates, R.H. Byrne, G. Chang, F.P. Chavez, R.A. Feely, A.K. Hanson, D.M. Karl, D. Manov, C. Moore, C.L. Sabine, and R. Wanninkhof. 2009. The NOPP O-SCOPE and MOSEAN projects: Advanced sensing for ocean observing systems. *Oceanogr. Mag*. 22:168–181.

Blackwell, S.M., M.A. Moline, A. Schaffner, T. Garrison, and G. Chang. 2008. Sub-kilometer length scales in coastal waters. *Cont. Shelf Res*. 28:215–226.

Chang, G., and T.D. Dickey. 2008. Interdisciplinary sampling strategies for detection and characterization of harmful algal blooms. pp. 43–84. In: Real-Time Coastal Observing Systems for Marine Ecosystem Dynamics and Harmful Algal Blooms. M. Babin, C.S. Roesler, and J.J. Cullen (eds). UNESCO Publications, Paris.

Kuwahara, V.S., G. Chang, X. Zheng, T.D. Dickey, and S. Jiang. 2008. Optical moorings-of-opportunity for validation of ocean color satellites. *J. Oceanogr.* 64:691–703.

Spada, F.W., D.V. Manov, and G. Chang. 2007. Interdisciplinary Ocean Sensor Technology Development. pp. 31-35. *Sea Tech*. Compass Publications Inc.

Chang, G., A.H. Barnard, and J.R.V. Zaneveld. 2007. Optical closure in a complex coastal environment: Particle effects. *Appl. Opt*. 46(31):7679–7692.

Benson, B., G. Chang, D. Manov, B. Graham, and R. Kastner. 2006. Design of a low-cost acoustic modem for moored oceanographic applications. Proceedings of The First ACM International Workshop on UnderWater Networks (WUWNet). ACM Press, Los Angeles, CA.

Chang, G.C., and R.W. Gould Jr. 2006. Comparisons of optical properties of the coastal ocean derived from satellite ocean color and in situ measurements. *Opt. Exp*. 14(22):10,149-10,163.

Chang, G.C., A.H. Barnard, S. McLean, P.J. Egli, C. Moore, J.R.V. Zaneveld, T.D. Dickey, and A. Hanson. 2006. *In situ* optical variability and relationships in the Santa Barbara Channel: Implications for remote sensing. *Appl. Opt.* 45(15):3593–3604.

Chang, G.C., Dickey, T., and M. Lewis. 2006. Toward a global ocean system for measurements of optical properties using remote sensing and in situ observations. pp. 285-326. In: Remote Sensing of the Marine Environment: Manual of Remote Sensing. J.F.R. Gower (ed). Vol. 6, Ch. 9. ASPRS Publications, Bethesda, MD.

Dickey, T., M. Lewis, and G. Chang. 2006. Bio-optical oceanography: Recent advances and future directions using global remote sensing and in situ observations. *Rev. Geophys*. 44:RG1001, doi: 10.1029/2003RG000148.

Dickey, T., G. Chang, C. Moore, A. Hanson, D. Karl, D. Manov, F. Spada, D. Peters, J. Kemp, O. Schofield, and S. Glenn. 2006. The Bermuda testbed mooring and HALE-ALOHA mooring programs: Innovative deep-sea global observatories. Proceedings of MTS/IEEE Oceans '06. V. Premus and A.J. Williams III (eds). Boston, MA.

Chang, G.C., and T.D. Dickey. 2004. Coastal ocean optical influences on solar transmission and radiant heating rate. *J. Geophys. Res*. 109:C01020, doi: 10.1029/2003JC001821. (Selected AGU Journal Highlight Article, JGR-Oceans)

Chang, G.C., K. Mahoney, A. Briggs-Whitmire, D. Kohler, C. Mobley, M. Moline, M. Lewis, E. Boss, M. Kim, W. Philpot, and T. Dickey. 2004. The new age of hyperspectral oceanography. *Oceanogr. Mag*. 17(2):22–29.

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Manov, D.V., G.C. Chang, and T.D. Dickey. 2004. Methods for reducing biofouling of moored optical sensors. *J. Atmos. Ocean. Tech*. 21(6):958–968.

Chang, G.C., T.D. Dickey, S. Jiang, D.V. Manov, and F.W. Spada. 2003. Optical methods for interdisciplinary research in the coastal ocean. In: Recent Research Developments in Optics. M. Kawasaki, N. Ashgriz, and R. Anthony (eds). Research Signpost, India. 3:249–270.

Chang, G.C., E. Boss, C. Mobley, T.D. Dickey, and W.S. Pegau. 2003. Toward closure of upwelling radiance in coastal waters. *Appl. Opt*. 42:1574–1582.

Chang, G.C., T.D. Dickey, O.M. Schofield, A.D. Weidemann, E. Boss, W.S. Pegau, M.A. Moline, and S.M. Glenn. 2002. Nearshore physical forcing of bio-optical properties in the New York Bight. *J. Geophys. Res*. 107:3133, doi:10.1029/2001JC001018.

Zheng, X., T. Dickey, and G. Chang. 2002. Variability of the downwelling diffuse attenuation coefficient with consideration of inelastic scattering. *Appl. Opt*. 41:6477–6488.

Boss, E., W.S. Pegau, W.D. Gardner, J.R.V. Zaneveld, A.H. Barnard, G.C. Chang, and T.D. Dickey. 2001. Particulate attenuation at the bottom boundary layer of a continental shelf. *J. Geophys. Res*. 106:9509–9516.

Chang, G.C., and T.D. Dickey. 2001. Optical and physical variability on time scales from minutes to the seasonal cycle on the New England shelf: July 1996 - June 1997. *J. Geophys. Res*. 106:9435–9453.

Chang, G.C., T.D. Dickey, and A.J. Williams III. 2001. Sediment resuspension over a continental shelf during hurricanes Edouard and Hortense. *J. Geophys. Res*. 106:9517–9531.

Dickey, T.D., and G.C. Chang. 2001. Temporal variability of optical and bio-optical properties of the ocean: recent advances and future visions. *Oceanogr. Mag*. 14:15–29.

Souza, A.J., T.D. Dickey, and G.C. Chang. 2001. Modeling water column structure and suspended particulate matter in the middle Atlantic continental shelf during the passage of hurricanes Edouard and Hortense. *J. Marine Res*. 59:1021–1045.

Chang, G.C. 1999. Analyses of bio-optical variability related to physical processes on the southern New England continental shelf: July 1996–June 1997. Ph.D. dissertation. University of California, Santa Barbara.

Chang, G.C., and T.D. Dickey. 1999. Partitioning in situ total spectral absorption by use of moored spectral absorption—attenuation meters. *App. Opt*. 38:3876–3887.

Dickey, T.D., G.C. Chang, Y.C. Agrawal, A.J. Williams III, and P.S. Hill. 1998. Sediment resuspension in the wakes of hurricanes Edouard and Hortense. *Geophys. Res. Lett*. 25:3533–3536.

Dickey, T., D. Frye, H. Jannasch, E. Boyle, D. Manov, D. Sigurdson, J. McNeil, M. Stramska, A. Michaels, N. Nelson, D. Siegel, G. Chang, J. Wu, and A. Knap. 1998. Initial results from the Bermuda testbed mooring program. *Deep-Sea Res*. 45:771–794.

Patents and Trademarks

United States Utility Patent No. #16/879,434 (approved). Vector Sensor-Based Acoustic Monitoring System.

United States Utility Patent No. 2018/0038840 A1 (approved). Optical-based Monitoring and Characterization of Natural Water.

U.S. Trademark SN 88884497. NoiseSpotter™.

Invited Presentations/Panels/Peer Reviews

Peer reviewer for a myriad oceanographic journals: Applied Optics; Aquaculture Environment Interactions; Continental Shelf Research; Deep-Sea Research; Estuaries; Estuaries and Coasts; Estuarine, Coastal, and Shelf Science; Geophysical Research Letters; Hydrobiologia; IEEE Transactions on Geoscience and Remote Sensing; Journal of Atmospheric and Oceanic Technology; Journal of Geophysical Research—Oceans; Journal of Marine Systems; Limnology and Oceanography; Limnology and Oceanography—Methods; Marine Technology Society; Oceanography Magazine; Optics Express; Progress in Oceanography; Science; Remote Sensing of Environment; UNESCO Publishing; Water Research. 1998 to present.

Peer reviewer for federal funding agencies: National Aeronautics and Space Administration (NASA), NSF, and Advanced Research Projects Agency – Energy (ARPA-E). 2001 to present.

Marine Energy Technology Symposium (METS) Board Member. 2018 to present.

Associate Editor for *Oceanography*. 2018 to present.

The Oceanography Society Co-Chair (2020) and Chair (2022) for the Ocean Sciences Meeting planning committee. 2018 to present.

Session Chair, "Numerical Modeling of Marine Energy Systems," International Conference on Ocean Energy. April 19, 2021.

Town Hall Panelist, "Supporting Marine Renewable Energy Development through Multi-Scale Testing," 2020 Ocean Science Meeting. February 19, 2020.

Panelist, "Non-Academic Career Panel," 2020 Ocean Sciences Meeting. February 20, 2020.

Short course titled "Evaluating Sediment Transport: Best Practices, Tools, Techniques, and Application to Site Management." Tenth International Conference on Remediation of Contaminated Sediments. January 2019.

Organizing committee member and session moderator. Ocean Waves Workshop. December 2017.

Planning committee member. Ocean Optics Conference. 2010 to 2016.

Seminar titled: "High-resolution biogeochemical monitoring using optical technology." Southern California Coastal Water Resources Project. January 2016.

Special seminar titled "Wave energy converter effects on wave propagation: A sensitivity study in Monterey Bay, CA." Oregon State University College of Earth, Ocean, and Atmospheric Sciences. November 2014.

Special seminar titled "Research Applications for Environmental Assessments." Oregon State University College of Earth, Ocean, and Atmospheric Sciences. November 2014.

Session titled "Marine Renewable Energy Research, Development, Evaluation, and Policy." Session co-convener and co-chair. Ocean Sciences Meeting. February 2014.

Lecture titled "A Deeper Look at Estuarine Processes—Wavelets and Circulation." Time Series in Marine Sciences and Applications for Industry workshop. September 2012.

Invited participant. Consortium for Ocean Leadership, NASA data QA/QC workshop. June 2012.

Review panelist for proposals submitted to "Gulf of Mexico Research Initiative." Consortium for Ocean Leadership. May 2012.

Lecture titled "Ocean Optics: Seeing Clearly in Muddy Waters." United States Geological Survey Western Coastal and Marine Geology seminar series. May 2010.

Lecture titled "Sediment Transport Investigations at Contaminated Sediment Sites." Southern California Coastal Water Research Project seminar series. April 2010.

Lecture titled "The Prediction of Visibility in Dynamic Surf Zone Environments." University of Hawaii Ocean and Resources Engineering seminar series. March 2010.

Lecture titled "Ocean Optics: Seeing the Light through Science and Technology." University of California at Los Angeles Physical Oceanography departmental seminar. May 2008.

Session titled "In Situ Optical Properties for the Investigation of Particle Dynamics." Session convener and chair. Ocean Sciences Meeting. March 2008.

Session titled "Ocean Observing: The State of the Art and Science." Session co-convener and co-chair. AGU Joint Assembly. May 2007.

Lecture titled "Introduction to Interdisciplinary Oceanographic Research." The Second Institute of Oceanography State Oceanic Administration in Hangzhou, China. March 2007.

Lecture titled "Introduction to Interdisciplinary Oceanographic Research." Shanghai Polar Institute in Shanghai, China. March 2007.

Lecture titled "Coastal Ocean Optical Applications." University of California at Santa Barbara marine sciences interdepartmental colloquium. February 2007.

Sessions titled "Ocean Observing: Coastal Observatories I, II, and III." Session co-chair. MTS/IEEE Oceans '06 conference. September 2006.

Lectures titled "Inherent Optical Properties—Data Visualization," "Apparent Optical Properties—Data Post-Processing," and "Observational Systems." HABWatch workshop: Real-Time Coastal Observing Systems for Ecosystem Dynamics and Harmful Algal Blooms. June 2003.

Invited participant. Patuxent River Naval Air Base scattering workshop. May 2002.

Presentations/Posters

Chang, G., F. Spada, C. Jones, G. Egan, S. Monismith, O. Fringer, and A. Manning. 2020. Variability of particle characteristics in a wave- and current-driven estuarine environment. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Egan, G., M. Cowherd, F. Spada, K. Scheu, A. J. Manning, C. Jones, G. Chang, and O.B. Fringer. 2020. Cohesive sediment erosion in a shallow, wave- and current-driven flow. Poster presentation at the 2020 Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Jones, C., S. McWilliams, K. Raghukumar, G. Chang, and J. Roberts. 2020. Optimization of wave energy converter array deployments while minimizing potential environmental risks. Oral

presentation at the 2020 Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Spada, F., K. Raghukumar, G. Chang, and C. Jones. 2020. NoiseSpotter: Real-time underwater acoustic characterization in support of marine renewable energy projects. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Raghukumar, K., G. Chang, F.W. Spada, and C.A. Jones. 2019. NoiseSpotter: A rapidly deployable acoustic monitoring and localization system. Oral presentation at the 13th European Wave and Tidal Energy Conference, Naples, Italy. September 1-6.

Raghukumar, K., F.W. Spada, G. Chang, and C. Jones. 2019. Characterization of near-bed particle motion by the NoiseSpotter: A three-dimensional vector sensor array. Poster presentation at the Fifth International Conference on the Effects of Noise on Aquatic Life. Den Haag, The Netherlands. July 7–12.

Raghukumar, K., G. Chang, F. Spada, C. Jones, J. Spence, S. Griffin, and J. Roberts. 2019. Performance characteristics of a vector sensor array in an energetic tidal channel. Oral presentation at the Underwater Acoustics Conference and Exhibition Series, Crete, Greece. June 30–July.

Raghukumar, K., G. Chang, F. Spada, and C. Jones. 2019. NoiseSpotter: New technology for underwater acoustic characterization. Poster presentation at 7th Annual Marine Energy Technology Symposium, Washington, DC. April 1–3.

Raghukumar, K., S. McWilliams, G. Chang, J. Roberts, and C. Jones. 2019. Marine hydrokinetic energy assessment: Balancing efficiency and environmental concerns. Poster presentation at the 7th Annual Marine Energy Technology Symposium, Washington, DC. April 1–3.

Chang, G., and T. Martin. 2019. Optically-based quantification of concentrations and fluxes of mercury and methylmercury in South River, Virginia (USA). Platform presentation at Tenth International Conference on the Remediation and Management of Contaminated Sediments, New Orleans, LA. February 11–14.

Egan, G., M. Cowherd, F. Spada, K. Scheu, A. Manning, C. Jones, S. Monismith, G. Chang, and O. Fringer. 2018. In situ observations of near-bed turbulence and cohesive sediment transport. Oral presentation at the American Geophysical Union Fall Meeting, Washington, DC. December 10–14.

Chang, G., F. Spada, G. Egan, A. Manning, K. Scheu, M. Cowherd, S. Monismith, C. Jones, and O. Fringer. 2018. Optics and acoustics for near-bed particle characterization and quantification of turbulence. Poster presentation at the Ocean Optics Conference (OOXIV), Dubrovnik, Croatia. October 7–12.

Raghukumar, K., F. Spada, G. Chang, and C. Jones. 2018. Initial field trials of the NoiseSpotter: An acoustic monitoring and localization system. Oral presentation at the 6th Annual Marine Energy Technology Symposium, Washington, DC. April 30–May 2.

Raghukumar, K., G. Chang, and C. Jones. 2018. Improved sea state characterization in support of marine renewable energy projects. Poster presentation at the 6th Annual Marine Energy Technology Symposium, Washington, DC. April 30–May 2.

Raghukumar, K., G. Chang, F. Spada, C. Jones, and T. Janssen. 2018. Spatial characterization of surface waves using an array of newly-developed wave buoys. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, Portland, OR. February 11–16.

Chang, G., C. A. Jones, and J.D. Roberts. 2018. A techno-economic analysis of wave energy conversion for the United States Pacific coast. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, Portland, OR. February 11–16.

Spada, F., P. Barney, G. Chang, W. Gans, T. Janssen, C. Jones, Z. Kirshner, K. Raghukumar, and J. Roberts. 2018. A motion-controlled wave buoy test stand for high fidelity data validation. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, Portland, OR. February 11–16.

Chang, G., C. Jones, and T. Martin. 2017. Innovative optical methods for characterization of chemical dynamics in a tidal estuary. Ninth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA.

Jones, C., G. Chang, F. Spada, T. Martin, M. Greenblatt, and R. Carscadden. 2017. Effective and efficient approaches to remedial investigation and long-term monitoring at large sediment sites. Ninth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA.

Martin, T., G. Chang, and C. Jones. 2017. Characterization of PCBs, mercury, and methyl mercury fate and transport in Berry's Creek Estuary. Ninth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA.

Martin, T., G. Chang, C. Jones, and F. Spada. 2016. Optically-based In-situ Characterization System (OPTICS) monitoring at sediment sites. Sediment Management Working Group.

Chang, G., C. Jones, T. Martin, and F. Spada. 2016. Optical tools for environmental monitoring. Ocean Optics XXIII, Victoria, B.C.

Chang, G., C. Jones, and T. Martin. 2016. Remedial investigation of water quality in a tidal estuary using novel optical methods. 2016 Ocean Sciences Meeting, New Orleans, LA.

Chang, G., F. Spada, C. Jones, T. Janssen, P. Barney, and J. Roberts. 2016. Coherent wave measurement buoy arrays to support wave energy extraction. 2016 Ocean Sciences Meeting, New Orleans, LA.

Chang, G., C. Jones, and T. Martin. 2015. Characterization of biogeochemical variability in a tidal estuary using high resolution optical measurements. American Geophysical Union Fall Meeting, San Francisco, CA.

Roberts, J., G. Chang, and C. Jones. 2015. Wave energy converter effects on nearshore wave propagation. The 11th European Wave and Tidal Energy Conference, Nantes, France.

Ruehl, K., A. Porter, C. Chartrand, H. Smith, G. Chang, and J. Roberts. 2015. Development, verification, and application of the SNL-SWAN open source wave farm code. The 11th European Wave and Tidal Energy Conference, Nantes, France.

Jones, C., G. Chang, and J. Roberts. 2015. Wave energy converter effects on wave, current, and sediment circulation: A coupled wave and hydrodynamic model of Santa Cruz, Monterey Bay, CA. Ocean Waves Workshop, New Orleans, LA.

Chang, G., C. Jones, and T. Martin. 2015. Near-bed sediment dynamics in the Berry's Creek tidal estuary. Eighth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA.

Chang, G., C. Jones, J. Roberts, K. Ruehl, and C. Chartrand. 2014. Wave energy converter effects on wave propagation: A sensitivity study in Monterey Bay, CA. American Geophysical Union Fall Meeting, San Francisco, CA.

Chang, G., C. Jones, T. Martin, and F. Spada. 2014. Optical methods for quantifying biogeochemical variability in a tidal estuary. Ocean Optics XXII, Portland, ME.

Martin, T., G. Chang, and C. Jones. 2014. Optically based determinations of biochemical variability in a tidal estuary. Ocean Optics XXII, Portland, ME.

Chang, G., C. Jones, J. Magalen, and J. Roberts. 2014. Wave energy converter effects on the nearshore environment. 2014 Ocean Sciences Meeting, Honolulu, HI.

Jones, C., G. Chang, F. Spada, and J. Roberts. 2014. Cost effective real-time wave assessment tool. 2014 Ocean Sciences Meeting, Honolulu, HI.

Chang, G., C. Jones, M. Mills, L. Lefkovitz, E. Foote, G. Durell, and J. Hardin. 2013. Novel methods for suspended sediment plume tracking. Seventh International Conference on Remediation of Contaminated Sediments, Dallas, TX.

Jones, C., M. Mills, G. Chang, J. Hardin, and E. Foote. 2012. Monitoring and analysis of suspended sediment flux remediation of sediment in the Ashtabula River. PIANC Dredging Conference, San Diego, CA.

Chang, G. 2012. Scattering layer effects on the modulation transfer function. Ocean Optics XXI, Glasgow, Scotland.

Jones, C., and G. Chang. 2012. A deeper look at estuarine processes—wavelets and circulation. ASBPA Conference, San Diego, CA.

Chang, G., K. Nelson, and C. Jones. 2012. Prediction of optical variability in dynamic nearshore environments. ASBPA Conference, San Diego, CA. (K. Nelson, presenter)

Chang, G., C. Jones, and E. Garland. 2011. Wavelet analysis for sediment transport investigations. Sixth International Conference on Remediation of Contaminated Sediments, New Orleans, LA.

Chang, G., and M. Twardowski. 2010. Point spread functions and visibility: Gaining clarity on image processing in natural waters. Ocean Optics XX, Anchorage, AK.

Spada, F., G. Chang, M. Twardowski, and S. Freeman. 2010. Cost effective platforms for the deployment of optical sensors in dynamic environments. Ocean Optics XX, Anchorage, AK.

Chang, G., M.S. Twardowski, S. Freeman, Y. You, M. Moline, C. Jones, D. Hansen, P.-W. Zhai, A.H. Barnard, and G.W. Kattawar. 2010. Optical variability and the prediction of underwater visibility. 2010 Ocean Sciences Meeting, Portland, OR.

Chang, G., Y. Agrawal, E. Boss, and P. Hill. 2009. In situ optical determinations of sediment dynamics. Fifth International Conference on Remediation of Contaminated Sediments, Jacksonville, FL.

Chang, G., and A.L. Whitmire. 2008. Particles, the backscattering ratio, and their effects on remote sensing: Toward solving the inverse problem in ocean optics. Ocean Optics XIX, Barga, Italy.

Chang, G., A.H. Barnard, and J.R.V. Zaneveld. 2008. Particle effects on optical closure. 2008 Ocean Sciences Meeting, Orlando, FL.

Chang, G., M. Honda, and F. Nencioli. 2008. Innovations in optics for coastal and open-ocean mooring applications. *Sea Tech*. Compass Publications Inc.

McPhee-Shaw, E.E., and G. Chang Spada. 2008. Integrating multiple coastal observing efforts to describe the circulation features of a southern California toxic bloom event. 2008 Ocean Sciences Meeting, Orlando, FL.

Spada, F.W., D. Manov, G. Chang, B. Benson, and R. Kastner. 2008. Real-time telemetry technologies for moored oceanographic applications. 2008 Ocean Sciences Meeting, Orlando, FL.

Chang, G., A. Whitmire, A. Barnard, J.R.V. Zaneveld, T. Dickey, and C. Moore. 2006. Optical closure in a coastal environment. Ocean Optics XVIII, Montreal, Canada.

Dickey, T., G. Chang, and the RaDyO principal investigators. 2006. The Radiance in a Dynamic Ocean (RaDyO) program. Ocean Optics XVIII, Montreal, Canada.

Dickey, T., G. Chang, C. Moore, A. Hanson, D. Karl, D. Manov, F. Spada, D. Peters, J. Kemp, O. Schofield, and S. Glenn. 2006. The Bermuda Testbed Mooring and HALE-ALOHA mooring programs: Innovative deep-sea global observatories. MTS/IEEE Oceans '06 Conference, Boston, MA.

Chang, G.C., and the SBC&BCO team. 2006. The Santa Barbara Channel and basin coastal observatory. Ocean Sciences Meeting, Honolulu, HI.

McPhee-Shaw, E.E., G. Chang, and T. Dickey. 2006. The SCCOOS shelf to shoreline observatory development, Santa Barbara Channel mooring: An ongoing time series of currents, thermal structure and optical properties of the water column over the continental shelf. Ocean Sciences Meeting, Honolulu, HI.

Arnone, R., R. Gould, W.P. Bissett, M. Moline, O. Schofield, G. Chang, and C. Davis. 2004. Optical classification of water masses using spectroscopy from space. Ocean Optics XVII, Fremantle, Australia.

Chang, G.C., T. Dickey, C. Moore, A. Barnard, R. Zaneveld, A. Hanson, and P. Egli. 2004. Bio-optical relationships in the Santa Barbara Channel: Implications for remote sensing. Ocean Optics XVII, Fremantle, Australia.

Zaneveld, J.R.V., C. Moore, A.H. Barnard, M. Twardowski, and G.C. Chang. 2004. Correction and analysis of spectral absorption data taken with the WET Labs ac-spectra. Ocean Optics XVII, Fremantle, Australia.

Chang, G.C., E.E. McPhee-Shaw, and T.D. Dickey. 2004. Optical characterization of phytoplankton blooms in the Santa Barbara Channel. ASLO/TOS Joint Ocean Research Conference, Honolulu, HI.

Dickey, T., A. Hanson, D. Karl, C. Moore, G. Chang, D. Manov, and F. Spada. 2004. The Multi-disciplinary Ocean Sensors for Environmental Analyses (MOSEAN) program. ASLO/TOS Joint Ocean Research Conference, Honolulu, HI.

Barnard, A.H., C.S. Roesler, T. Dickey, G. Chang, and D. Manov. 2004. Biofouling prevention of bio-optical sensors: Data from long-term ocean mooring deployments. AGU Ocean Sciences Meeting, Portland, OR.

Moore, C., T. Dickey, G. Chang, D. Manov, F. Spada, A. Hanson, and D. Karl. 2004. The Multi-disciplinary Ocean Sensors for Environmental Analyses (MOSEAN) program. AGU Ocean Sciences Meeting, Portland, OR.

Chang, G.C., and T.D. Dickey. 2003. Variability of solar transmission and radiant heating rate in the coastal ocean: Optical impacts. IUGG, Sapporo, Japan.

Chang, G.C., and T.D. Dickey. 2002. Optical impacts on solar transmission in coastal waters. Ocean Optics XVI, Santa Fe, NM.

Prentice, J.E., A.D. Weidemann, W.S. Pegau, K.J. Voss, M. Lee, E. Shybanov, O. Martynov, A. Laux, A. Briggs, and G. Chang. 2002. Laboratory comparisons of optical scattering instrumentation. Ocean Optics XVI, Santa Fe, NM.

Chang, G.C., T.D. Dickey, E. Boss, C. Mobley, and W.S. Pegau. 2002. Toward closure of in situ upwelled radiance in coastal waters. AGU/ASLO Ocean Sciences Meeting, Honolulu, HI.

Souza, A.J., T.D. Dickey, and G.C. Chang. 2002. Modeling water column structure and suspended particulate matter on the middle Atlantic continental shelf during the passages of hurricanes Edouard and Hortense. AGU/ASLO Ocean Sciences Meeting, Honolulu, HI.

Chang, G.C., T.D. Dickey, O.M. Schofield, A.D. Weidemann, and S.M. Glenn. 2001. Temporal and spatial variability of physical and bio-optical properties on the New York Bight inner continental shelf. IAPSO/IABO 2001: An Ocean Odyssey Meeting, Mar del Plata, Argentina.

Chang, G.C., T.D. Dickey, and O. Schofield. 2001. Physical processes related to bio-optical properties on the New York Bight inner continental shelf. ASLO Aquatic Sciences Meeting, Albuquerque, NM.

Chang, G.C., T.D. Dickey, O. Schofield, and W.P. Bissett. 2000. High temporal resolution optical and physical time series data: Coastal mixing and optics and LEO-15. Ocean Optics XV, Monte Carlo, Monaco.

Chang, G.C., and T.D. Dickey. 2000. Temporal and vertical variability of partitioned total spectral absorption on a continental shelf. AGU/ASLO Ocean Sciences Meeting, San Antonio, TX.

Boss, E., W.S. Pegau, W.D. Gardner, J.R.V. Zaneveld, A.H. Barnard, G.C. Chang, and T.D. Dickey. 2000. Particulate attenuation in the bottom boundary layer of a continental shelf. AGU/ASLO Ocean Sciences Meeting, San Antonio, TX.

Chang, G.C., and T.D. Dickey. 1999. Salinity intrusions along a shelf/slope front. ASLO Aquatic Sciences Meeting, Santa Fe, NM.

Chang, G.C., and T.D. Dickey. 1998. High temporal resolution spectral absorption measurements during the coastal mixing and optics experiment. Ocean Optics XIV, Kona, HI.

Chang, G., T. Dickey, J. McNeil, M. Levine, L. Redekopp, D. Bogucki, and T. Boyd. 1998. Internal solitary waves and optical variability during the coastal mixing and optics experiment. Ocean Optics XIV, Kona, HI.

Chang, G.C., and T.D. Dickey. 1998. Preliminary observations of bio-optical variability associated with internal solitary waves during the coastal mixing and optics experiment. In: The 1998 WHOI/IOS/ONR internal solitary wave workshop: Contributed papers, Eds. T.F. Duda and D.M. Farmer, Technical Report WHOI-99-07, pp. 65–68. Woods Hole Oceanographic Institution, Woods Hole, MA.

Chang, G.C., T.D. Dickey, D.V. Manov, D.E. Sigurdson, A.J. Williams, J. Trowbridge, P.S. Hill, and Y.C. Agrawal. 1998. Sediment resuspension events forced by Hurricanes Edouard and Hortense. AGU/ASLO Ocean Sciences Meeting, San Diego, CA.

Manov, D.V., D.E. Sigurdson, J.D. McNeil, G.C. Chang, S. Zedler, T. Gilboy, and T.D. Dickey. 1998. Design of bio-optical and physical systems for moorings: Bermuda Testbed Mooring and Coastal Mixing and Optics. AGU/ASLO Ocean Sciences Meeting, San Diego, CA.