Ecosystems and Biogeochemical Cycling in a Changing Ocean

Fifth Annual Ocean Carbon and Biogeochemistry Summer Workshop; La Jolla, California, 19–22 July 2010

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The Ocean Carbon and Biogeochemistry (OCB) program is a coordinating body for the U.S. research community that focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology. The fifth annual Ocean Carbon and Biogeochemistry summer workshop, sponsored by the U.S. National Science Foundation, NASA, and the National Oceanic and Atmospheric Administration, convened 107 participants at the Scripps Institution of Oceanography, in California.

The workshop opened with a session on the Arctic, which is undergoing rapid changes in response to warming, accelerated melting of large ice sheets, and reductions in seasonal sea ice cover. This session included two presentations that addressed implications of increasing sea ice melt for sea surface carbon dioxide (CO_2) and carbonate ion concentrations in the western Arctic Ocean. Another presentation focused on recent observations of seasonally changing aragonite saturation in the northern coastal Gulf of Alaska. Moving on to the Bering Sea, a speaker described the impact of decreasing sea ice extent on autotrophs, including primary productivity, export, and community composition.

Many models are predicting a significant expansion of oxygen minimum zones (OMZs) in response to increasing anthropogenic CO_2 emissions, which will affect marine productivity, carbon and nutrient cycling, and food webs. A plenary session on low-oxygen regions opened with a characterization of key features of the biological pump in open-ocean OMZs. Another presentation described the adaptations of and physiological challenges facing benthic (living on or near the seafloor) organisms in upwelling OMZs. Shifting the focus to coastal regions, one speaker illustrated the increasing incidence of coastal hypoxia related to anthropogenic nutrient loading and subsequent eutrophication, and provided an overview of insights gained from the application of molecular biological and stable isotope techniques to detect and differentiate key transformations in the marine nitrogen cycle. The final speaker in the session described global, regional, and paleo modeling approaches to exploring the implications of expanding OMZs for marine biogeochemical cycles.

Benthic and pelagic (living in the water column) ecosystems are intimately linked by way of biogeochemical cycling and transformation, and benthic-pelagic coupling along continental shelves represents a significant unknown in coastal carbon budgets. A plenary session on benthic-pelagic interactions opened with a presentation on molecular approaches that have improved understanding of marine nitrogen and carbon cycling and community structure in the intermediate nepheloid layers of OMZs. To assess the role of benthic oxygen consumption in seasonal hypoxia on the Oregon shelf, the next speaker described the application of an eddy correlation method to quantify benthic oxygen exchange rates. Another presentation focused on the application of stable isotope tracers and linear inverse modeling to better understand carbon cycling in benthic marine food webs. Using data from time series sediment traps in the Gulf of Maine, the final speaker illustrated the importance of benthic nepheloid layer processes to carbon cycling in continental margins.

The meeting also included presentations on the carbon sink potential of vegetated coastal ecosystems; regional updates on the North American coastal synthesis activities; overviews of recent ocean acidification, ocean fertilization, and Gulf of Mexico oil spill activities; community discussions of the next U.S. Carbon Cycle Science Program plan; and partner program and agency updates.

For further information, please visit http://www.whoi.edu/workshops/ocbworkshop2010.

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Assessing the Accuracy of Landscape-Scale Phenology Products

An International Workshop on the Validation of Satellite-Based Phenology Products; Dublin, Ireland, 18 June 2010

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A 1-day international workshop on the accuracy assessment of phenology products derived from satellite observations of the land surface was held at Trinity College Dublin. This was in conjunction with the larger 4-day Phenology 2010 conference. Phenology is the study of recurring plant and animal life cycle stages (such as leafing and flowering, maturation of agricultural plants, emergence of insects, and migration of birds). The workshop brought together producers of continental- to global-scale phenology products based on satellite data, as well as providers of field observations and tower-mounted near-surface imaging sensors whose data are useful for evaluating the satellite products. The meeting was held under the auspices of the Committee on Earth Observing Satellites (CEOS) Land Product Validation (LPV) subgroup. The mission of LPV is to foster quantitative validation of high-level global land products derived from remotely sensed data and relay results that are relevant to users.

The workshop's goal was to bring together the international community and develop a plan to effectively use field observations and near-surface imaging techniques to validate satellite-based phenology products. The main agenda items of the meeting included an overview of global and regional remote sensing phenology products, presentations on in situ networks and near–remote sensing/tower-based observations, and open discussion of how to proceed with an internationally coordinated validation and intercomparison activity. The full meeting agenda and links to presentation are available at http://lpvs.gsfc.nasa.gov/LPV_meetings/Phenology_mtg.html.

Discussion highlighted the challenges of validating remotely sensed phenology products. A particular issue for phenology products is that they involve a physical signal from the ground as well as a temporal component. In addition, the in situ phenology networks are often interested in local-scale observations that are not directly comparable to the aggregate vegetation response observed via satellite. However, the presentations at the meeting indicated that there have been advances made in tower-based and in situ measurements that can help quantify the accuracy of satellite-based phenology products.

There was consensus to establish a set of "core sites" where future remote sensing phenology validation efforts will focus. The initial set of sites would include two to four localities in each network: PAR@METER, Phenological Eyes Network (PEN), and PhenoCam (see presentations from Fred Baret, Shin Nagai, and Andrew Richardson, respectively). Two additional sites currently conducting validation of phenology products