Effect of Zooplankton Community Structure and Nutrient Cycling at the Bermuda Atlantic Time-series study (BATS) Site

Deborah K. Steinberg1 (1-804-684-7838; debbie@vims.edu)
Laurence P. Madin2 (1-508-289-2739; lmadin@whoi.edu)

1Virginia Institute of Marine Science, P.O. Box 1346, Gloucester Point, VA 23062, United States
2Woods Hole Oceanographic Institution, Biology Department, MS 38, Woods Hole, MA 02543, United States

The structure of zooplankton communities has a significant impact on biological transport and cycling of nutrients and organic carbon in the ocean. Zooplankton play an integral role in the transfer of energy and the biogeochemical cycling of nutrients. Migrating zooplankton actively transport a substantial amount of dissolved inorganic and organic carbon to depth horizons where microbial processes can transform the carbon. This study examines the temporal and spatial variability of zooplankton community structure and nutrient cycling at the BATS site. Zooplankton community structure at BATS displays seasonal dynamics in terms of species diversity and biomass. Zooplankton actively transport organic carbon and nutrient material to depth horizons where microbial processes can transform the nutrient material. Zooplankton play an integral role in the biogeochemical cycling of nutrients in the ocean. Zooplankton biomass alone is not necessarily a good predictor of flux; the species composition of zooplankton has been shown to be a significant factor in determining the composition and rate of sedimentation of organic carbon. Zooplankton can constitute on average 33% (maximum over 50%) of the sediment trap flux. An effort is under way to quantify the contribution of zooplankton to organic carbon flux in order to better understand the role of zooplankton in controlling the fate of organic carbon in the oceans.

OS51D-0510 0830h INVITED POSTER

Simultaneous Determination of Oceanic and Atmospheric Parameters by Spectral Optimization: A Validation

Roman Chomka1
Howard R. Gordon2 (1-305-284-2323; hgordon@miami.edu)

1University of Miami, Ocean表 Department, Coral Gables, FL 33146
2Department of physics, University of Miami, Coral Gables, FL 33146

Key Words: radiative transfer, boreal spring

The second step is to invert the direct model to retrieve aerosol and marine parameters by minimizing the distance between observed and computed TOA reflectances. The formalism of the Spectral Optimization Algorithm (Chomko and Gordon, 1998) is particularly adapted to a NN approach. We present the results of a 3-month study of the seasonal cycle of aerosol and oceanic reflectances at the Bermuda Atlantic Time-series Study (BATS) site. The algorithm is validated by using it to invert the direct model for a dataset of observed and computed TOA reflectances. The algorithm is validated by using it to invert the direct model for a dataset of observed and computed TOA reflectances.

OS51E-02 0845h

Use of a Neural Network Algorithm to Improve Atmospheric Correction of Ocean Color Imagery

Cedric Jamet1 (33-1-44-27-23-41; cedric.jamet@cea.fr)
Sylvie Thrill1 (33-1-44-27-07-08; Sylvie.Thill@odyscience.fr)
Moulin4 (33-1-44-27-07-08; moulin4.odyscience.fr)
Michel Crepon2 (Michel.Crepon@odyscience.fr)
Howard R Gordon3 (gordon@phyvax.physics.miami.edu)

1Universite Paris VI Pierre et Marie Curie, Laboratoire d'Océanographie Dynamique et de Climatologie (LODYC), Tour 26, case courrier 100, 4, place Jussieu, Paris Cedex 05 75272, France
2Laboratoire des Sciences du Climat et de l'Environnement (LSCE), CEA/CNRS, bat 709, Gif-sur-Yvette 91191, France
3Department of physics, University of Miami, Coral Gables, FL 33146, United States
4NOAA National Ocean Services, 1385 East-West Hwy, N/S/C, Silver Spring, MD 20910, United States

Key Words: Neural Networks, Atmospheric Correction

The retrieval of ocean constituents from satellite ocean color measurements is very sensitive to the atmospheric correction. Existing operational algorithms generally fail when strongly absorbing aerosols (pollution, mineral dust ...) are present in the atmosphere. Improvement of atmospheric correction algorithms, which simultaneously estimate ocean and aerosol optical properties, have been shown to perform well for absorbing aerosols. However, their requirements in terms of satellite type and time scale from which to derive operational ocean color data processing.

In this context, advanced programming techniques such as Neural Network (NN) can help in implementing improved atmospheric correction algorithms in operational processing. The formalism of the Spectral Optimization Algorithm (Chomko and Gordon, 1998) is particularly adapted to a NN approach. We present the results of a 3-month study of the seasonal cycle of aerosol and oceanic reflectances at the Bermuda Atlantic Time-series Study (BATS) site. The algorithm is validated by using it to invert the direct model for a dataset of observed and computed TOA reflectances. The various NN were trained using a set of radiative transfer simulations. For most of the cases, the accuracy was found to be better than 5% RMD on the whole visible spectrum. The second step is to invert the direct model to retrieve aerosol and marine parameters by minimizing the distance between observed and computed TOA reflectances. This variational method is easy to implement since it is straightforward to compute the gradients (adjoint) of a direct model based on NN. We show that first results from a new version applied to a plume of pollution aerosols off the U.S. East Coast, and we discuss the results of this new version applied to a plume of pollution aerosols off the U.S. East Coast.
A range of realistic slopes of remote sensing reflectance between in situ and SeaWiFS chlorophyll-a data were found for the same data sets for different atmospheric corrections, showing a range of realistic slopes of remote sensing reflectance. Particulate backscattering makes a much smaller contribution to the observed Rrs than phytoplankton absorption. The shortwave scattering and absorption characteristics of the marine atmosphere vary widely in space and time due to the variety of aerosol types, aerosol concentrations, and cloud structures that can be present. Aerosols over the oceans may originate from a variety of sources. Some are locally produced by wind-wave interaction, others are long-range transported from distant regions. In clear skies, advected continental aerosols can have a significantly different radiative impact than marine aerosols. The effects of particle scattering and enhanced the effects of shortwave absorption. Remote sensing of in situ properties of oceanic waters show distinct clusters that diverge significantly from the expected relationship in the composition of chlorophyll-a when using standard Case-1 algorithms. These differences remain after normalizing chl-a concentrations to high chl-a concentrations. Near-surface chl-a for the Southern Ocean, Antarctica, and the Antarctic Peninsula is lower than satellite observations, which underestimates near-surface chl-a for the Southern Ocean by about 30-40% in the range of 0.8 - 3 mg chl m$^{-3}$. At low (< 0.4) and high chl-a (> 4) mg chl m$^{-3}$ concentrations to low but data (e.g. the NASA global data set used for the ocean color assessment) show that chlorophyll concentrations to evaluate 4 optical properties diverges significantly from Case-1 waters and current SeaWiFS algorithms overestimate the observed variability in remote sensing reflectance. The shortwave scattering and absorption characteristics of the marine atmosphere vary widely in space and time due to the variety of aerosol properties, aerosol concentrations, and cloud structures that can be present. Aerosols over the oceans may originate from a variety of sources. Some are locally produced by wind-wave interaction, others are long-range transported from distant regions. In clear skies, advected continental aerosols can have a significantly different radiative impact than marine aerosols.
OS51E-12 1135h

Maritime Aerosol Optical Model Based on the Aerosol Robotic Network (AERONET) Measurements.

Alexander Eminov1,2,3,4,5

1University of Alabama in Huntsville, Huntsville, Alabama
2AEI Marine Science, East Point, Georgia
3NASA / Goddard Space Flight Center, 970.2, Greenbelt, MD 20771, United States
4Berkeley, CA 94704, United States
5University of Wisconsin, Madison, Wisconsin

OS51E-11 1120h

Comparison of Satellite Estimates of Aerosol Optical Thickness and Cloud Cover Measurements

Mary Jane Bartholomew1 (631-344-2444; bartholomew@bnl.gov), Mark A Miller2 (631-344-2958; miller@bnl.gov), Giulietta Pargoz3 (301-286-0740; g.pargoz@nasa.gov), Sean Bailey4 (301-286-3931; shalley@micronet.nsf.gov), Rebecca Reynolds5 (631-344-7838; reynolds@bnl.gov)

1The Brookhaven National Laboratory, Upton, NY 11973, United States
2NASA / Goddard Space Flight Center, 970.2, Greenbelt, MD 20771, United States
3NASA / Goddard Space Flight Center, Building 28, Greenbelt, MD 20771, United States
4FutureTech Corp., SeaWiFS and SIMBIOS Projects, NASA / Goddard Space Flight Center, 970.2, Greenbelt, MD 20771, United States
5SAIC, SeaWiFS Project, Code 970.2, NASA Goddard Space Flight Center, 970.2, Greenbelt, MD 20771, United States

The FRSR data base have been analyzed for the presence of optically active aerosol regimes over the world's oceans and quantifying the aerosol optical properties in these regimes. Uncertainties in the measurements have been quantified and are used as filtering criteria. Data from the instrument, after significant processing, are combined with aerosol chemical and optical properties in these regimes. Differences in the aerosol properties in different regimes are documented.

URL: http://www.gim.bnl.gov/