PROJECT NAME	A novel approach toward the estimation of net ecosystem metabolism in estuary-plume systems using optical and modeled data
ACRONYM	A novel approach toward the estimation of net ecosystem metabolism in estuary-plume systems using optical and modeled data
STUDY REGION	-
PRINCIPAL INVESTIGATOR	Dr. Joseph Salisbury
DURATION	March 1, 2006 - March 31, 2009
PROJECT WEBSITE	Link to project website
LOICZ PROJECT DATABASE	Click here for more project information

PROJECT DESCRIPTION

The main objective of this proposal is to pursue strategies for the estimation of net ecosystem metabolism in estuarine-plume systems using a combination of modelled and satellite data. The main objective of this proposal is to pursue strategies for the estimation of net ecosystem metabolism using modeled sea surface alkalinity and optically retrieved pCO2 as carbonate system input parameters.

This proposal responds to the call for studies relating to carbon cycling and ecosystems within the context of the New Investigator Program. Specifically, the proposed work will address the following two questions as outlined in NASA¿s Research and Analysis Focus section of the ROSES document: How will carbon cycle dynamics and terrestrial and marine ecosystems change in the future?

What are the consequences of climate change and increased human activities for coastal regions? Net ecosystem metabolism (NEM) represents the balance between gross production and respiration.

This rate is of great value for research dealing with water quality, trophic exchanges and carbon cycling. Variability in coastal NEM arises from a complex suite of biochemical and physical drivers and is influenced by interactions with land, atmosphere and ocean. Temporal changes in NEM are related to surface water dissolved inorganic carbon (DIC) variability, primarily through the production and utilization of CO2 during photosynthesis and respiration. Tracking changes in surface DIC and thus NEM, requires temporal information on at least two carbonate system inputs, which for this proposal will be modeled sea surface alkalinity and optically retrieved pCO2.

The test site will be the well-studied Kennebec (ME) estuary-plume system. Alkalinity distributions will be estimated based on an assumption of conservative mixing of fresh and oceanic endmembers using a high-resolution coastal circulation model presently under development at the University of Maine. Temporally varying riverine alkalinity fluxes will be estimated using the UNH Water System¿s FRAMES model, while the oceanic flux will be tied to salinity and modeled circulation.

Recent research at UNH suggests the potential for accurate pCO2 retrievals in optically complex surface waters using chlorophyll and colored organic matter fluorescence, beam attenuation and sea surface temperature data. Under this proposal I will expand such research, concentrating on inherent and apparent optical properties as a means to the end of remote pCO2 retrievals using satellite data. Merging of land-flux and coastal circulation models with the proposed NEM retrievals will enable synoptic monitoring of coastal metabolism and the tracking of its response to land-use, climate change and variability in coastal circulation. In addition to basic research and technical development, an exciting education and outreach program is proposed.

These efforts will encourage student participation in local watershed-estuary research and promote understanding of how aggregate local phenomena can scale to impact the global earth system. The educational component will include the design and implementation of an undergraduate earth system science course for aspiring elementary teachers, a secondary teacher workshop focusing on land-ocean interactions, and an ongoing monitoring and research program for secondary students.

THE PROJECT RELATES TO THE FOLLOWING PRIORITY TOPICS AND SCIENTIFIC THEMES

Priority Topics:

2 - Assess and predict impact of environmental change on coastal ecosystems

Scientific Themes:

4 - Biogeochemical Cycles in Coastal and Shelf Waters