A REMOTE SENSING AND REGIONAL DOWNSCALING APPROACH TO THE ECOLOGICAL FORECASTING OF POTENTIALLY TOXIC DIATOM BLOOMS IN CALIFORNIA AND THE CHESAPEAKE BAY

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ABSTRACT

Recent downscaling efforts for the Southern California Bight (SCB) and the Chesapeake Bay have led to hydrodynamic models currently being applied to empirical habitat models for the neurotoxin-producing diatom group, *Pseudo-nitzschia* (Amnesic Shellfish Poisoning). Statistical models for predicting the occurrence of potentially toxic diatom blooms in the Santa Barbara Channel (SBC) and the Chesapeake Bay were developed with in situ monitoring observations and then used to create hindcasts of bloom probabilities using SCB-ROMS and ChesROMS. Environmental parameters significantly associated with toxic blooms off the coast of central CA are similar to those for the SBC, suggesting certain communities across ecosystems. The Chesapeake Bay is a highly-entropied estuarine system structured by riverine inputs and oceanic intrusions, while the SBC is a region where wind-driven upwelling and mesoscale eddies are important processes driving phytoplankton blooms. In both systems, *Pseudo-nitzschia* blooms pose an increasing threat to human and wildlife health, rendering possible mitigation by bloom prediction a desired goal for public health and resource managers.

**STUDY SITE & DATA**

Monthly cell abundance and toxin data were collected at 7 stations in the Santa Barbara Channel, off the coast of central CA, from November 2004 – June 2006. Concurrent hydrographic, chemical, and optical properties were measured and examined in relation to bloom data to determine associations that could be useful for prediction.

**THE SANTA BARBARA CHANNEL – California Current System**

**The majority of blooms in the record occur in the middle and lower bay-mouth region (CB5.1, CB6.1, CB6.4, CB7.3E, CB7.4) with notable hotspots for bloom development in tidal estuarine zones (EE3.0, EE3.3, LE1.1, LE3.1, LE2.2, RET1.1). Although several large blooms were recorded during the 1980s and 1990s, blooms at the mouths of major tributaries such as the Potomac, Choptank, and Patuxent Rivers are relatively small and infrequent prior to 1997 at which point the lower bay and tidal estuaries appear to become synchronized.**

**HINDCASTS**

**TOXIC BLOOM PREDICTIONS: MAY 29, 2008**

Cell abundance is predicted to be highest near Pt. Conception, while pDA is highest within the confines of a seasonally occurring convergent eddy when cells are potentially more physiologically stressed.

**FUTURE WORK**

An active area of current research is the selection and nesting of proper ecosystem models within ROMS. Validation is a key component of assessing predictive skill, and we are working closely with researchers and decision-makers to evaluate model performance. We will continue to refine the merging of satellite and regionally downscaled forecasting products with these empirical habitat models to assess forecasting capabilities and any potential connections to large-scale climate modes.