Merging MODIS ocean color and a downscaled regional ocean model to predict harmful algal blooms for coastal California

Clarissa Anderson[†]; Raphael Kudela; Claudia Benitez-Nelson; Yi Chao; David Siegel
[†] University of Californa, Santa Cruz, USA
Leading author: clrander@ucsc.edu

Since 2000, the Santa Barbara Channel in has become a seasonal "hot spot" of harmful algal bloom (HAB) activity in coastal California (CA). The toxin-producing diatom Pseudo-nitzschia is the dominant HAB genus in the region, frequently causing blooms that negatively impact marine wildlife and put humans at risk of amnesic shellfish poisoning when the neurotoxin domoic acid (DA) is produced and transferred through the marine foodweb. An apparent link between upwelling-related physical signatures, macronutrients, and toxic diatom blooms in the various "hotspots" throughout California has motivated attempts to forecast harmful algal blooms (HABs) as a function of select environmental variables. Empirical models for predicting toxic Pseudo-nitzschia blooms in the Santa Barbara Channel are tested in a nowcast mode using predictions based on merging data from MODIS ocean color geophysical products and the Regional Ocean Modeling System (ROMS) downscaled to the Southern California Bight. Thresholds for each model generate event forecasts. Spatially-explicit, monthly HAB maps are compared to shipboard observations and State of California monitoring data, demonstrating that the models predict offshore events otherwise undetected by nearshore monitoring. The use of mechanistic hydrodynamic models in concert with empirical, biological models facilitates future process studies on the effects of coastal eutrophication and climate change on regional HAB dynamics.