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Subsurface seeding of surface harmful algal blooms observed through the integration of autonomous gliders, moored environmental sample processors, and satellite remote sensing in southern California

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ABSTRACT

An observational study was performed in the central Southern California Bight in Spring 2010 to understand the relationship between seasonal spring phytoplankton blooms and coastal processes that included nutrient input from upwelling, wastewater effluent plumes, and other processes. Multi-month Webb Slocum glider deployments combined with MBARI environmental sample processors (ESPs), weekly pier sampling, and ocean color data provided a multidimensional characterization of the development and evolution of harmful algal blooms (HABs). Results from the glider and ESP observations demonstrated that blooms of toxic *Pseudo-nitzschia* sp. can develop offshore and subsurface prior to their manifestation in the surface layer and/or near the coast. A significant outbreak and surface manifestation of the blooms coincided with periods of upwelling, or other processes that caused shallowing of the pycnocline and subsurface chlorophyll maximum. Our results indicate that subsurface populations can be an important source for “seeding” surface *Pseudo-nitzschia* HAB events in southern California.

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