THE WIND-DRIVEN COASTAL OCEAN: NOW IN HIGH-DEF

By John A. Barth, John M. Bane, Stephen D. Pierce, and Sara M. Haines

New observational tools and coordinated interdisciplinary research conducted during the CoOP program greatly expanded our understanding of wind-driven coastal ocean ecosystems. These tools allowed us to probe the entire water column, the air-sea interface, and the atmosphere above with unprecedented spatial and temporal resolution. A new "high-definition" view of the time-varying coastal ocean has emerged. During the Coastal Ocean Advances in Shelf Transport (COAST) CoOP project (http://damp.coas.oregonstate.edu/coast), sampling of the coastal ocean with a ship-towed, underwater, undulating vehicle and a shipboard acoustic Doppler current profiler was done simultaneously with profiling of the overlying atmosphere from an instrumented twin-engine airplane. This detailed view revealed the interaction of a wind-driven coastal upwelling jet with a submarine bank, and the impact of this flow-topography interaction on the coastal marine ecosystem. Disruption of the strong, alongshelf, oceanic coastal upwelling jet by Heceta Bank creates a "lee" region close to shore where near-surface phytoplankton thrive. As the oceanic jet flows around the bank, plankton, nutrients and cold, saline water are swept off the continental shelf, enriching the offshore northern California Current marine ecosystem. The region of cooler air temperature inshore and below about 200 m is a stable atmospheric internal boundary layer, created by contact with cold, upwelled water; this internal boundary layer, in turn, alters the alongshore coastal wind field. (See Volume 110 (C10) of the *Journal of Geophysical Research* for more details.)

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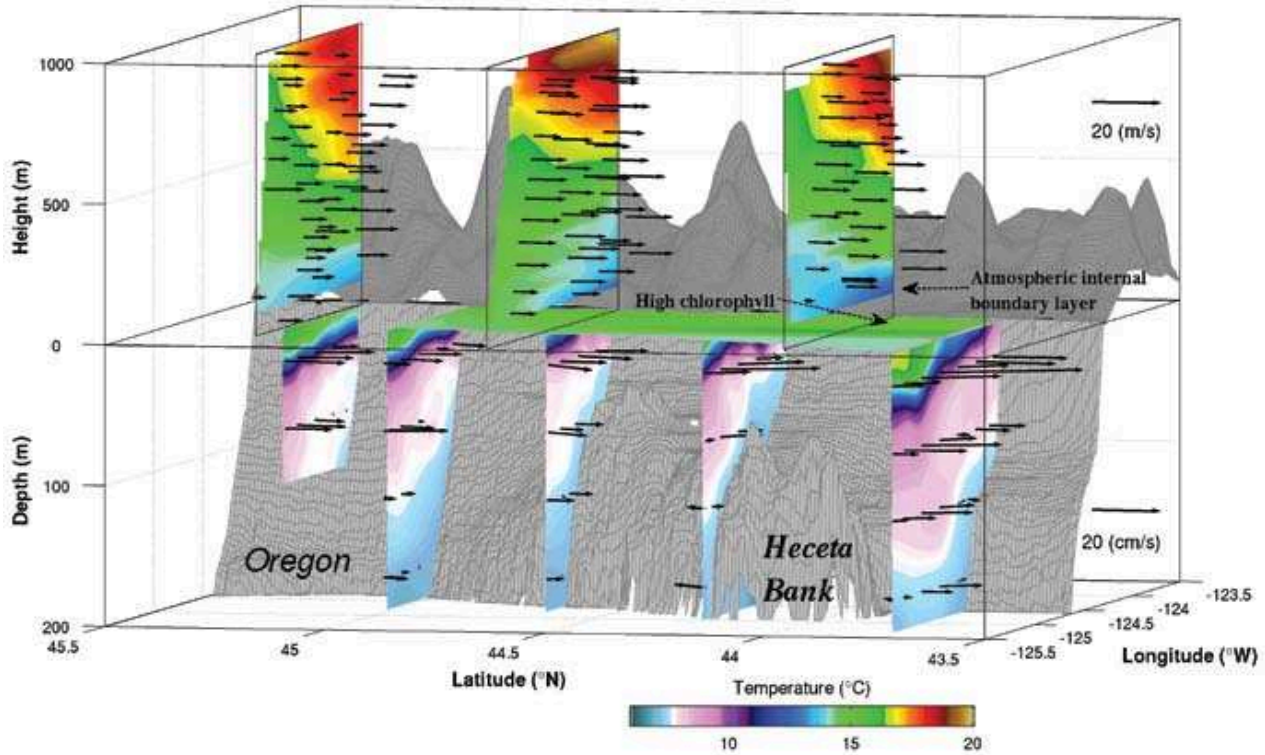

Visualization of atmospheric potential temperature and oceanic temperature (vertical sections), winds and ocean currents (arrows), and surface chlorophyll (green shades at sea surface) off central Oregon on August 19, 2001. Surface chlorophyll concentrations are scaled to use the color bar such that light blue is about 1 mg m^{-3} and dark green is 20 mg m^{-3}. The highest phytoplankton concentrations are found over Heceta Bank (see also the article by Kudela et al., this issue). The four southern oceanic sections combine temperature data from ship-towed and air-deployed sensors.