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# Modeling and observations of coupled bio-optical, bioluminescent and physical properties.

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Dynamical physical, biochemical and bioluminescent models are combined together for forecasting coupled bio-optical, physical properties and for interpretation of the upwelling event development in the Monterey Bay, CA. Inshore observations from AUVs and model predictions show consistent coincidence of chlorophyll, backscatter, and bioluminescence maxima during upwelling development. Offshore AUVs observations (taken at the entrance to the bay) show deeper bioluminescence maximum below the surface layers of high chlorophyll and backscatter values during the earlier stages of upwelling development. Later, the observed deep offshore bioluminescence maximum disappeared and became a shallower and much weaker signal, coinciding with high chlorophyll and backscatter values offshore. Observations and models suggest that with the development of upwelling, the offshore water masses with the subsurface layer of bioluminescent zooplankton were replaced by water masses advected from the northern coast of the bay with a relatively high presence of mostly non-bioluminescent phytoplankton. Based on the biochemical, physical and bioluminescence models, a methodology for estimating the night time water leaving radiance due to stimulated bioluminescence is demonstrated and evaluated.