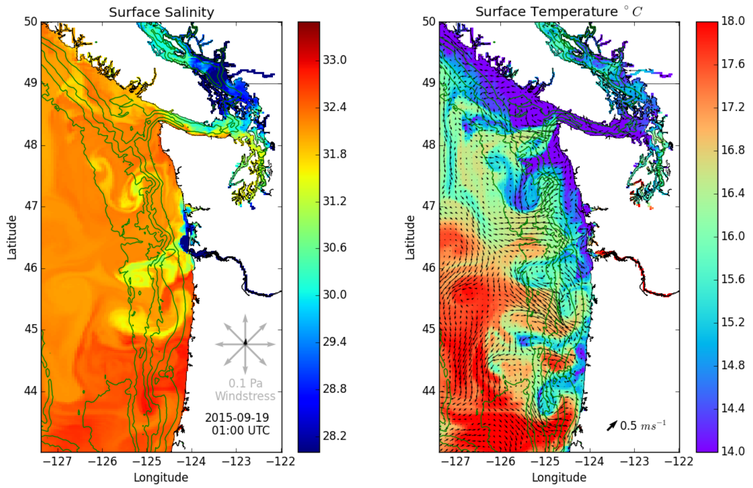
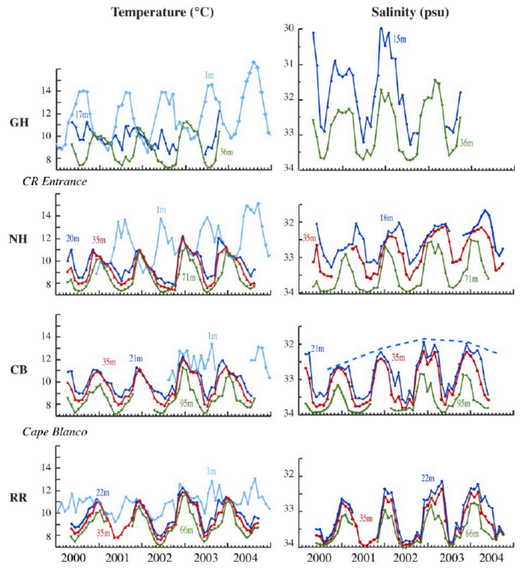
Effect of the "Blob" on shelf water properties in the NE Pacific

P. MacCready*, S. Siedlecki, R. McCabe, University of Washington, Seattle, WA, USA, pmacc@uw.edu

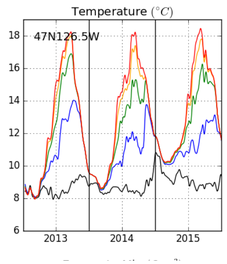


Surface fields on Sept. 19, 2015 from LiveOcean. The Columbia River plume is evident, along with cold water near the coast associated with wind-driven upwelling.



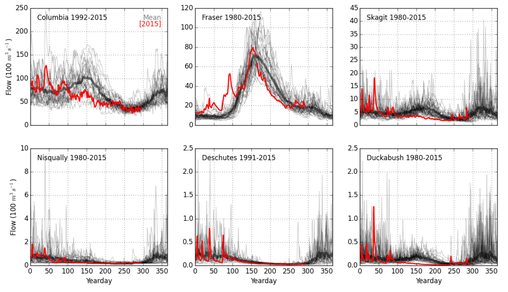
Observations over the northern California Current System, mid-shelf, show that 2 degC variation in winter temperatures is not uncommon. Figure courtesy of Barbara Hickey. Station locations are GH = Grays Harbor (47 N), NH = Newport Hydrographic Line (44.5 N), CB = Cape Blanco (43 N), and RR = Rogue River (42 N).

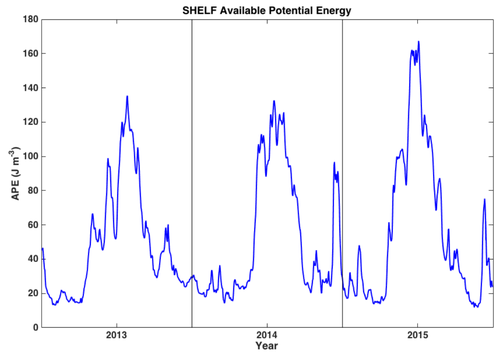
The anomalously warm water mass in the NE Pacific, "the Blob," has strongly perturbed NE Pacific waters since 2013. Here we explore the effect of this anomaly on shelf and slope water properties, using a high-resolution (1.5 km) realistic hindcast model. The model, LiveOcean (http://faculty.washington.edu/pmacc/LO/LiveOcean.html) is run as a daily forecast, and has been run continuously since January 2013. The model, ROMS, is forced with realistic WRF winds, tides, 16 rivers, and open ocean boundary conditions supplied by the global data-assimilative HYCOM model (10 km resolution).



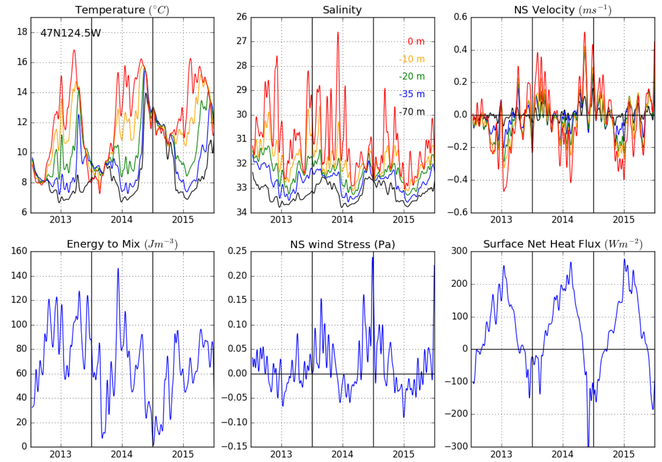
Model fields from a virtual mooring at 47 N, 126.5 W (in about 3000 m of water off Grays Harbor, WA). The seasonal cycle of temperature over the top 70 m (upper left panel) shows little difference in peak summer temperatures across the three years. However, the winter of 2014-15 is about 2 degC warmer than the year before.

2015 was an anomalously low-flow year during the summer, due to low snow pack from the previous winter. This is especially apparent in the Columbia River.





The net upwelling on the shelf in the whole model domain may be quantified as the Available Potential Energy required to raise water parcels adiabatically through a "flattened" stratification. There is a clear annual cycle, but it shows no obvious difference among the three years.



Model fields from a virtual mooring at 47 N, 124.5 W (mid-shelf, in about 73 m of water off Grays Harbor, WA). The seasonal cycle of temperature at over the top 70 m (upper left panel) shows a longer period of warm surface waters in the summer of 2014, and much warmer (~3 degC) waters on the shelf during the winter of 2014-15. There was less evidence of Columbia River plume water in 2015 (top middle panel) perhaps due to the extremely low spring freshet that year. There is no clear difference among the three years in NS currents (upper right), NS wind stress (lower middle), or surface heat flux (lower right). The stratification, quantified as the energy required to mix the water column completely (lower left) may indicate weaker stratification in 2015 compared to the previous two years.