High-latitude climate connection between global and coastal
Upwelling supports a productive marine ecosystem in the Northern California Current

Sea-surface temperature

Seasonal cycle of winds

spring transition
Warm water anomalies, changes in stratification, and changes in the water properties of the upwelling “source” waters (temperature, nutrients, dissolved oxygen) can profoundly influence the marine ecosystem.

Example: 
1997-1998 El Niño
Waters upwelled off Oregon come from far away, transported by ocean currents …
Ocean currents are driven by the wind … and the upper-ocean is stirred by strong storms.
High-latitude winds and upper-ocean properties are measured at the OOI Gulf of Alaska station PAPA.
Wind-driven mixing in the Gulf of Alaska sets upper-ocean properties (temperature, salinity, nutrients, dissolved oxygen)

Big changes year-to-year!

Plot by H. Freeland (IOS)
The “Warm Blob” in Feb 2014

Line P upper-ocean T anomalies, Feb 2014

Deep warming in late 2013, early 2014

Fig. 1(a) Sea surface temperature anomalies (°C) in NE Pacific Ocean for February 2014. Anomalies are calculated relative to the mean from 1981 – 2010.  
(b) Upper ocean temperature anomalies (°C) along “Line P” (heavy gray line shown in part a) from 48° 34.5N, 125° 30.0W to 50° 145°W for February 2014. Anomalies are relative to the mean from 1956-1991.  
(c) Monthly temperature anomalies (normalized) from the surface to 200 m averaged over the area of 50 to 40 °N, 150 to 135 °W (indicated by the box shown in part a) for the period of January 1980 through November 2014.
Examine data from non-OOI moorings off central Oregon along the Newport Hydrographic Line (44° 39’N)
non-OOI mooring data

Plot by Craig Risien (OSU)
Surface Temperature, 6/1/2014 – 3/14/2015 (non-OOI mooring data)

- 10° C is typical winter surface temperature
- 8° C in one day!

Plot by Mike Kosro (OSU)
OOI Endurance
Washington Offshore
(CE09)

OOI Endurance
Oregon Shelf
(CE02)
OOI Endurance Oregon Shelf Surface Water Temperature 2015-2016

Plot by Craig Risien (OSU)
Endurance Wire Following Profiler CTD

Endurance Array Wire Following Profiler

Climatology from World Ocean Atlas 2013

Warm Blob

3 profiles / day
2014-10-08 – 2015-12-01

Plot by Jon Fram