Daily Forecast Model of Ocean Acidification

Science information sheet

WASHINGTON OCEAN ACIDIFICATION CENTER
UNIVERSITY of WASHINGTON
MARINE RESOURCES ADVISORY COUNCIL

To adapt to ocean acidification conditions, Washington's shellfish industry needs the ability to forecast corrosive seawater conditions on a day-to-day basis (Washington State Blue Ribbon Panel Action 7.4.1). The Washington State Legislature provided $325,000 to the Washington Ocean Acidification Center (WOAC) to develop short-term forecasts of corrosive conditions for application to shellfish hatcheries, growing areas, and other areas of concern.

What is the ocean acidification forecast model?

WOAC selected a team to create a daily forecast computer model of ocean circulation for the Washington coast and Puget Sound. The model operates similar to those used in making weather forecasts, but instead of predicting rain and temperature, it predicts ocean currents, temperature, and salinity. This model also predicts ocean chemistry conditions, such as pH, and can forecast when corrosive ocean acidification will occur.

Continued expansion of the forecast model is needed in 2015-17

Funds are required to maintain the daily forecast system for Washington waters and keep it publically available. The portion of the model that is specific to Puget Sound will need additional work, and finer scale models should be incorporated for individual inlets, such as Willapa Bay, Totten Inlet, and Hood Canal. WOAC also will work with regional stakeholders and resource managers to improve the public website presentation of the forecast system to assure that it is user-friendly and delivers the information they need. This work will help Washington shellfish growers protect their shellfish stocks from corrosive waters.

Why is this type of forecast model so useful to shellfish growers?

Increased CO_2 in the atmosphere is absorbed by the ocean, increasing the acidity of the seawater. At times, these waters are actually corrosive to shelled organisms like oysters and some plankton, preventing them from forming or maintaining their shells. While ocean acidification is a global problem, the problem is made worse in the Pacific Northwest by local circulation patterns. The same ocean currents and chemistry that cause hypoxia in Hood Canal and on our coast also make the seawater more corrosive. The result has been dramatic for our shellfish industry – for most of the last decade there has been no natural set of oysters in Willapa Bay, causing growers to rely on hatcheries. The hatcheries themselves have lost oysters when especially corrosive waters are drawn in from the nearby ocean.

In order for the shellfish industry to respond to this crisis, improved information is critical. This forecast model gives Washington shellfish growers the benefit of knowing about corrosive water events several days in advance. This allows them to more efficiently manage their hatchery operations.

What you need to know

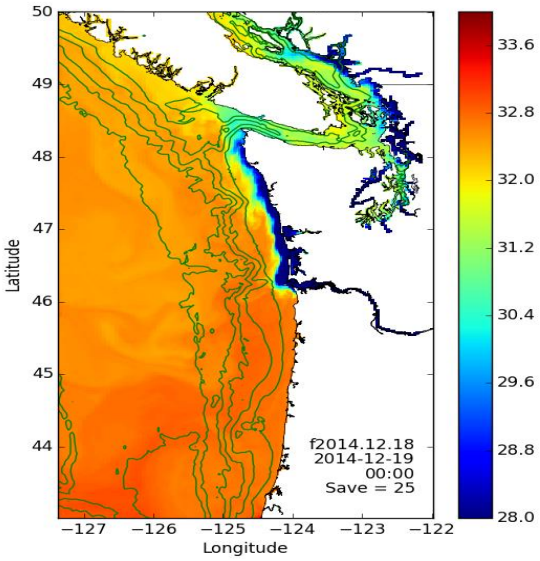
- $325,000 provided by State Legislature to assist shellfish industry in making short-term forecasts of corrosive or ocean acidification conditions
- The model provides real-time information accessible to shellfish growers and managers to track acidification on a scale of 3-7 days, giving them time to change or adjust their management practices
- Uses an online platform (created in collaboration with Microsoft Research) to make data publicly available

How was the forecast model devleoped?

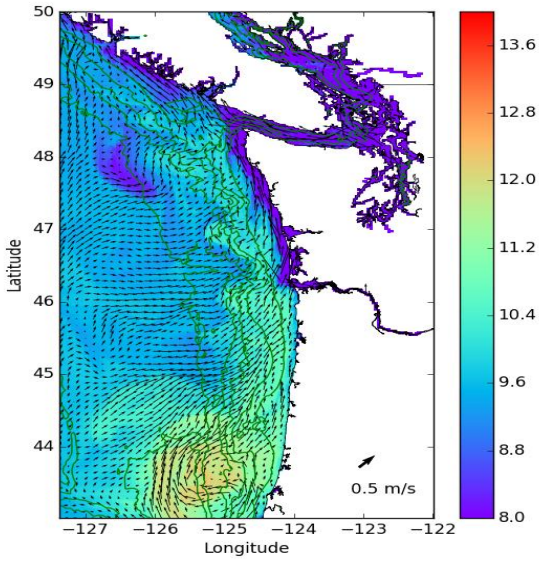
Ocean salinity and temperature affect pH and carbon chemistry, and are important variables to understand in forecasting corrosive ocean conditions. Other ocean processes and input from rivers can also significantly affect the pH and carbon chemistry of the coastal ocean and inland waters like Willapa Bay and Puget Sound. Through modeling salinity we have learned that the Columbia River is very important to regulating ocean chemistry, especially to nearby coastal estuaries and even the Puget Sound.

Since November 2014, the WOAC model has made daily forecasts of currents, temperature, and salinity. Additional forecast models currently in development will predict pH and carbon chemistry. By the end of the biennium, the public will be able to view these forecasts from a website.

Example model forecasts of surface salinity, temperature, and currents for December 2014. The salinity figure reveals outflow from the Columbia River forms a region of fresher water (lower salinity values) hugging the Washington coast, driven by the southerly winds typical of our winter storms. Getting the behavior of the river plume in the model correct, verified by data, is important because it strongly influences the chemistry of waters reaching the shellfish growing areas in places like Willapa Bay.



Surface Salinity



Surface Temperature (degrees C)

For more information

See the Washington Ocean Acidification Center website:
http://coenv.washington.edu/research/major-initiatives/ocean-acidification/

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