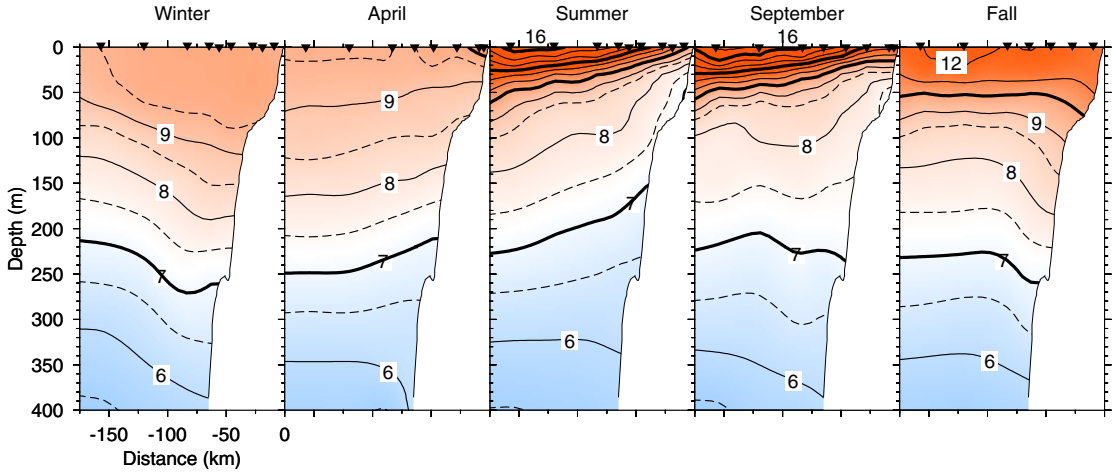
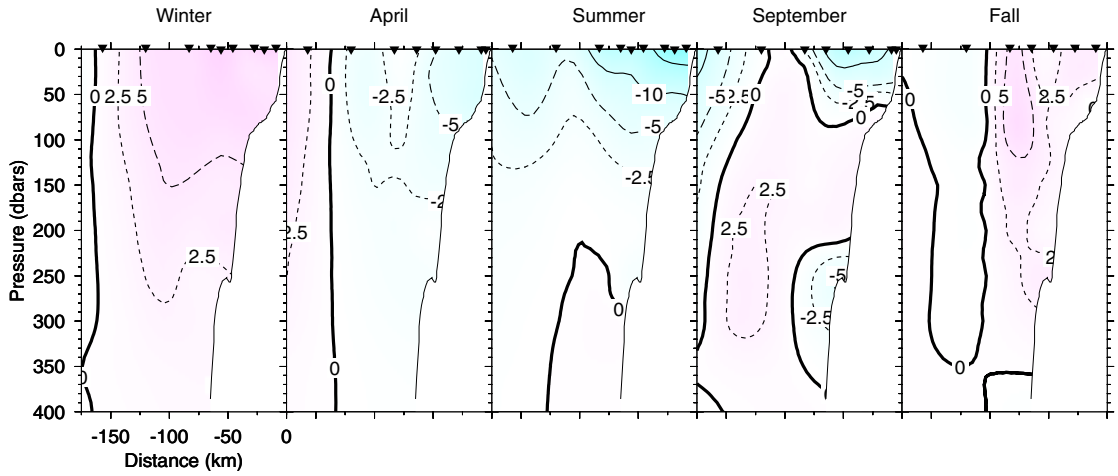
OCEAN CLIMATE CHANGE OFF OREGON?

Oregon's ocean is an ever-changing home to fisheries, recreation and shipping. With the possibility of long-term climate change, it is essential to understand how and why ocean conditions change. With this goal, we have been measuring the current, temperature and salinity off Newport on a seasonal basis since July 1997. The sampling line extends from the coast to 85 nautical miles off Newport; temperature and salinity measured to a maximum depth of 1000 meters at 12 locations along 44.6 N, and currents are measured to 400 meters acoustically. Temperature and salinity measurements were made regularly along this line from 1961 to 1971; these past data show the seasonal cycle clearly. Recent observations can be compared with the seasonal means from 1961-1971 for evidence of climate change. Although current measurements were not made in 1961-1971, the alongshore (north-south) component of the current can be estimated from the density distribution calculated from the temperature and salinity measurements.

Seasonal Average Temperatures (°C) 1961-1971



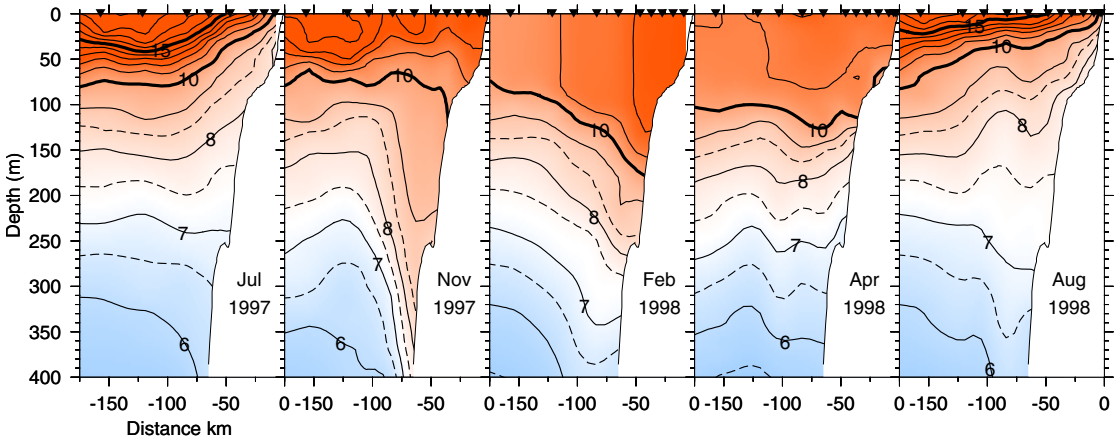
Seasonal Average Geostrophic Velocity (cm per second, red northward, blue southward)



The seasonal cycle in the Oregon ocean is strong. Winds from the southwest are prevalent in fall and winter, causing surface waters to move northward and shoreward. In spring and summer, winds from the north are prevalent and cause upwelling of cold, dense water at the coast; the sea surface temperature increases from below 10 C at the coast to greater than 15 C offshore and surface currents are southward.

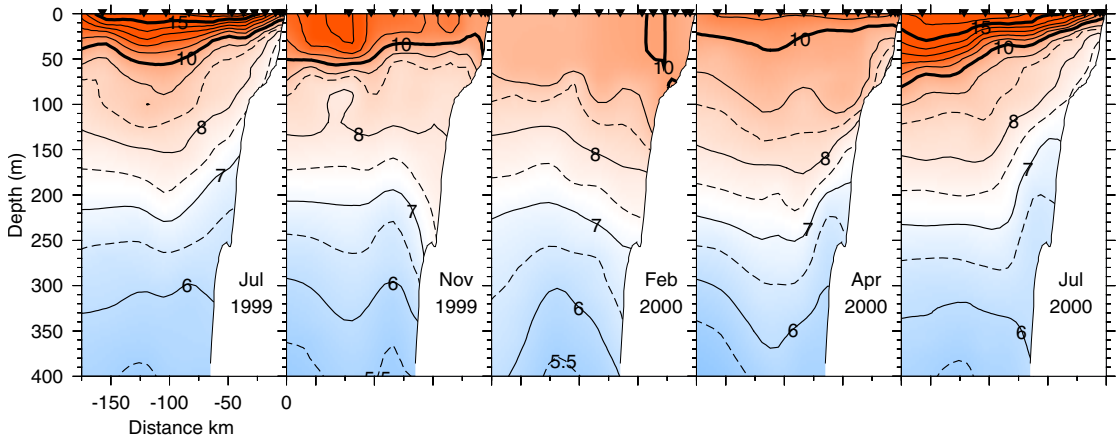
Of course, each year is different. The largest interannual variability comes with El Niño. El Niño originates in the equatorial Pacific but can reach the Oregon ocean as it did in 1997-8. In local and global impact, the strongest Niños of the century were those in 1997-8 and 1982-3. Between July 1997 and September 1998, Oregon coastal waters were significantly warmer than the averages for 1961-1971.

Temperatures (°C) during El Niño 1997-8



Since November 1998, water temperatures off Oregon have not been significantly different from the corresponding seasonal averages for the decade of 1961-1971. Those averages are based on observations during a cool phase of the Pacific Decadal Oscillation (PDO) that dominated the Northeast Pacific from 1947 to 1976. (The PDO is a variation in the North Pacific's atmosphere and ocean that lasts a decade or two with a pattern of opposite temperature anomalies in the eastern and western North Pacific. The PDO signal is weaker than that of El Niño but is of much longer duration.) Our present monitoring study began in 1997 at the onset of El Niño, during a warm phase of the PDO that ended with the 1999 La Niña (the cold opposite of El Niño). Are we now in a cool PDO phase? The question is one of the reasons for this study. If we are in a cool phase of the PDO, we may soon see an Oregon ocean like that before 1976.

Recent Temperatures



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