23 May 2008

By: Gabriel Gache, Science News Editor

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Pacific Coast Lines Turn Acidic

Carbon dioxide increases oceanic water acidity

An international team of researchers participating in a study on board the Oregon State University vessel have discovered high levels of acidified ocean water within as little as 32 kilometers away from the shoreline of the West Coast of the North American continent. The acidic water is probably 50 years old and is brought up by deep oceanic currents in concordance with the rise of atmospheric temperatures and carbon dioxide concentrations, which have been rising drastically in the last five decades. "When the upwelled water was last at the surface, it was exposed to an atmosphere with much lower carbon dioxide levels than today's. The water that will upwell off the coast in future years already is making its undersea trek toward us, with ever-increasing levels of carbon dioxide and acidity. The coastal ocean acidification train has left the station, and there's not much we can do to derail it", said Burke Hales, an associate professor in the College of Oceanic and Atmospheric Sciences at Oregon State University. The main concern is for the marine ecosystems in the coastal areas of Mexico and Canada, as water acidification started rising significantly in the last years, in response to the high levels of carbon dioxide gas absorbed by the ocean from the atmosphere. Once it reaches water, the carbon dioxide forms carbonic acid compounds that attack the calcium carbonate mineral forming the shells of a series of marine creatures.Phytoplankton and zooplankton species may also be sensitive to the rise of water acidity, even though most of the phytoplankton species have calcite shells that are not susceptible to carbonic acids. "There is much research that needs to be done about the biological implications of ocean acidification. We now have a fairly good idea of how the chemistry works", Hales added.It is more than obvious now that carbon dioxide atmospheric concentrations are to blame on the frantic burning of fossil fuels. According to some studies, five decades ago the carbon dioxide concentrations were of about 310 parts per million, more than any other levels in the past couple of million years. Currently, carbon dioxide levels reach 380 parts per million, triggering a nutrient rise in areas with upwelling water which in turn allows even more phytoplankton to grow."The hypoxia is caused by persistent upwelling that produces an over-abundance of phytoplankton. When the system works, the upwelling winds subside for a day or two every couple of weeks in what we call a "relaxation event" that allows that buildup of decomposing organic matter to be washed out to the deep ocean. But in recent years, especially in 2002 and 2006, there were few if any of these relaxation breaks in the upwelling and the phytoplankton blooms were enormous. When the material produced by these blooms decomposes, it puts more CO2 into the system and increases the acidification", Halles explained.The study reveals that the acidic water found recently has carbon dioxide concentrations between 900 and 1,000 parts per million, which is more than enough for it to have a damaging effect on calcium carbonate shells."If we're right on the edge now based on a starting point of 310 parts per million, we may have to assume that CO2 levels will gradually increase through the next half century as the water that originally was exposed to increasing levels of atmospheric carbon dioxide is cycled through the system. Whether those elevated levels of carbon dioxide tip the scale for aragonites remains to be seen. But if we somehow got our atmospheric CO2 level to immediately quit increasing, we'd still have increasingly acidified ocean water to contend with over the next 50 years", Hales said.Nevertheless, Hales points out that predictions regarding the effect of this acidic ocean water on marine life are premature. Barnacles, clams and aragonites would have most likely been exposed, but may be adapting in order to minimize the consequences."You can't just splash some acid on a clamshell and replicate the range of conditions the Pacific Ocean presents. This points out the need for

cross-disciplinary research. Luckily, we have a fantastic laboratory right off the central Oregon coast that will allow us to look at the implications of ocean acidification", Hales concluded.