Data Series 883

Field Activities 12BHM01, 12BHM02, 12BHM03, 12BHM04 and 12BHM05 on the West Florida Shelf, in February, April, May, June and August 2012

By Lisa L. Robbins, Paul O. Knorr, Kendra L. Daly, and Kira E. Barrera

Abstract

Atmospheric carbon dioxide (CO_2) is absorbed by the ocean's surface where it combines with seawater to form a weak, naturally occurring acid called carbonic acid (H_2CO_3). Increasing carbon dioxide in the atmosphere results in the absorption of more CO_2 by the ocean and, therefore, increases in the acidity of seawater. This process, known as ocean acidification, has the potential to elicit change in ecosystems and organisms by disrupting biological processes. For example, ocean acidification is a problem for marine organisms such as corals, foraminifera, and algae that precipitate calcium carbonate to form their skeletons and shells (Kleypas and others, 2006). The effects are related to corresponding changes in the carbonate saturation state (Ω), where Ω is the ratio of the ion concentration product (Ca^{2+} x CO_3^{2-}) to the stoichiometric aragonite solubility product (K^*_{sp}) (Langdon and Atkinson, 2005). Because pH and CO_3^{2-} are strongly interdependent through the inorganic carbon system, the decrease in pH will cause a proportionally greater decrease in CO_3^{2-}.

Globally, ocean acidification is occurring faster than at any time in the last 300 million years (Broeker and others, 1979). Recent evidence indicates that individual oceans are responding at different rates, depending on physical and biological processes. For example in the Arctic Ocean, the rate of saturation state decrease was 2.1 percent per year between 1997 and 2010 (Robbins and others., 2013) in an area as large

First posted October 27, 2014

- **Report** (HTML format, 19 KB)

For additional information, contact:
Director, St. Petersburg Coastal and Marine Science Center
U.S. Geological Survey
600 4th Street South
St. Petersburg, FL 33701
(727) 502-8000
http://coastal.er.usgs.gov/

as Montana, largely because of increases in melt of ice, versus the average rate observed for the Pacific Ocean (0.36 percent per year) (Feely and others, 2012). Unfortunately, comparative data sets over multiyear time frames are often not available because time series baseline carbon information has not been collected in many oceans. Data are needed in subtropical latitudes where carbonate saturation states are already naturally low and fluctuate seasonally. These data will help construct a baseline for the assessment of future changes.

As part of the U.S. Geological Survey (USGS) Coastal and Marine Geology Program project "Response of Florida Shelf Ecosystems to Climate Change" and in partnership with Kendra Daly, University of South Florida (USF), data on surface ocean carbonate chemistry were collected on five cruises along transects on the shallow inner west Florida shelf and northern Gulf of Mexico in 2012. Data from the 2011 cruises were also published (Robbins and others., 2013). The data collected allows the USGS, National Oceanic and Atmospheric Administration (NOAA), and USF scientists to map variations in ocean chemistry including carbonate saturation states along designated tracks. The USGS also partners with NOAA and the National Aeronautics and Space Administration (NASA) to model air-sea flux as part of a Gulf of Mexico Carbon Synthesis project led by NASA.

Suggested citation:

Robbins, L.L., Knorr, P.O., Daly, K.L., and Barrera, K.E., 2014, USGS Field Activities 12BHM01, 12BHM02, 12BHM03, 12BHM04, and 12BHM05 on the West Florida Shelf, in February, April, May, June, and August 2012: U.S. Geological Survey Data Series 883, *http://dx.doi.org/10.3133/ds883*.

ISSN 2327–638X (online)

Contents