AS ICE MELTS, ANTARCTIC BEDROCK IS ON THE MOVE

COLUMBUS, Ohio -- As ice melts away from Antarctica, parts of the continental bedrock are rising in response -- and other parts are sinking, scientists have discovered.

The finding will give much needed perspective to satellite instruments that measure ice loss on the continent, and help improve estimates of future sea level rise.

These results are being derived from the building of POLENET, a growing network of Global positioning system (GPS) trackers and seismic sensors implanted in the bedrock beneath the West Antarctic Ice Sheet (WAIS), reoccupying sites previously measured by the West Antarctic GPS Network (WAGN) and the Transantarctic Mountains Deformation (TAMDEF) network.

Michael Bevis, Michael Willis, and POLENET leader Terry Wilson, all from Ohio State University, reported the results at the American Geophysical Union meeting in San Francisco.

"The preliminary results show that we can dramatically improve our estimates of whether Antarctica is gaining or losing ice," said Wilson. Some satellites measure the height of the WAIS, and scientists calculate ice thickness by subtracting the height of the earth beneath it. They must take into account whether the bedrock is rising or falling. Ice weighs down the bedrock, but as the ice melts, the earth slowly rebounds. As the upper layer of the earth flexes, the deep earth mantle layer flows toward the rebound center. The GRACE satellite mission measures the gravity signal of changing mass. To isolate the change due to thinning or thickening of the ice sheets, the mass change due to flow of dense mantle during rebound must be subtracted.

Before POLENET, and it's more spatially limited predecessors, direct measurements were too sparse and scattered to know for sure what was happening in the bedrock. Scientists had to rely on computer models, which now appear to be incorrect.

"When you compare how fast the earth is rising, and where, to the models of where ice is being lost and how much is lost -- they don't match," Wilson said. "There are places where the models predict no crustal uplift, where we see several millimeters of uplift per year. We even have evidence of other places sinking, which is not predicted by any of the models."

A few millimeters may sound like a small change, but it's actually quite large, she explained. Crustal uplift in parts of North America is measured on the scale of millimeters per year.

POLENET's GPS sensors measure how much the crust is rising or falling, while the seismic sensors measure the stiffness of the bedrock -- a key factor for predicting how much the bedrock will rise in the future. "We're pinning down both parts of this problem, which will improve the correction made to the satellite data, which will in turn improve what we know about whether we're gaining ice or losing ice," Wilson said. Better estimates of sea level rise can then follow.

POLENET scientists have been implanting sensors in Antarctica since December 2007. The network will be complete in 2010 and will record data into 2012. Selected sites may remain as a permanent Antarctic observational network.

Scientists around the world can access POLENET data online, and schools can access educational resources as part of the International Polar Year.

Ohio State's POLENET partners in the United States are Pennsylvania State University, the University of Texas at Austin, New Mexico Tech, Washington University, the Jet Propulsion Laboratory, and the University of Memphis. A host of international partners are part of the effort as well.

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