MARIE THARP LECTURE SERIES FOR OCEAN RESEARCH | **NO.41**

GEOMAR

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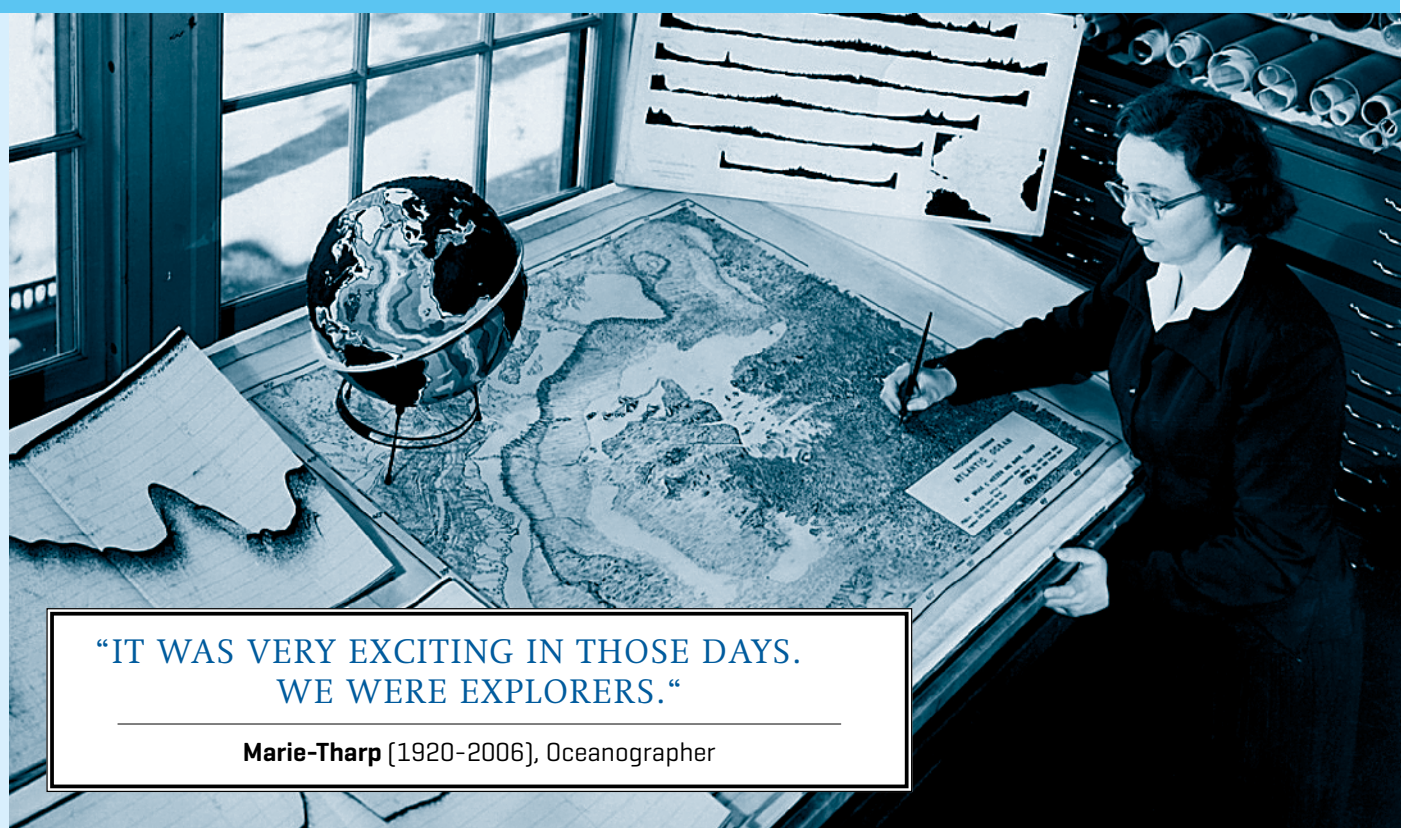

"IT WAS VERY EXCITING IN THOSE DAYS. WE WERE EXPLORERS."

Marie-Tharp [1920-2006], Oceanographer

Online Seminar Tuesday, 28th June 2022, 14:00 CEST

What can past warm periods tell us about the stability of polar ice sheets?

The amount of polar ice melt during past warm periods can guide our understanding and prediction of future sea level rise. For instance, global climate during the mid-Pliocene warm period appears to have been ~2-3°C warmer than today with atmospheric CO_2 values between 350-450 ppm. Yet despite decades of study, the maximum sea level rise during this time period remains uncertain with estimates ranging from 5 to >35 meters above present. Why such variability?

Researchers have focused study of past sea level on stable passive margins, believing these regions would preserve sea level indicators with minimal post-depositional movement. However, we have shown that glacial isostatic adjustment can significantly influence the elevation of ancient shorelines far from polar regions and derived a methodology for correcting Pliocene sea level observations for time-varying deformation of the solid Earth caused by ice sheet loading. We have also shown that dynamic topography (elevation changes caused by the force exerted on the lower crust by the buoyant upper mantle) can also cause tens of meters of surface uplift, in areas far from any active tectonic plate boundary, on timescales as short as a few million years. Using the methodologies we developed during the study of Pliocene shorelines, we recently assessed published sea level rise estimates for the most recent interglacial, the Eemian. We estimate maximum sea level during the last interglacial was probably much lower than the value of 6-9 m currently cited, possibly implying greater stability of the polar ice sheets in the face of a 1-2°C global warming.

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