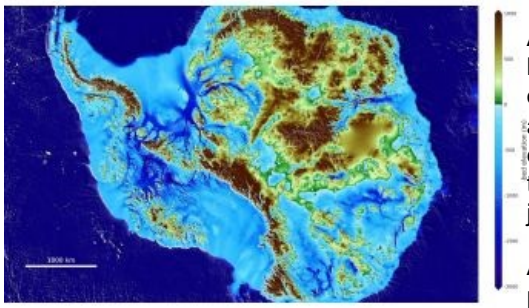
VIDEO INCLUDED

BedMachine Will Help Reduce the Uncertainty in Sea Level Rise



A team of glaciologists has unveiled the most accurate portrait yet of the contours of the land beneath Antarctica's ice sheet – and, by doing so, has helped identify which regions of the continent are going to be more, or less, vulnerable to future climate warming, according to a news release of the British Antarctic Survey. Anticipated by the global cryosphere and environmental science communities, the newly released Antarctica topography map, BedMachine, and related findings were published last month in the journal *Nature Geoscience*.

Among results of the BedMachine project are the discovery of stabilizing ridges that protect the ice flowing across the Transantarctic Mountains; a bed geometry that increases the risk of rapid ice retreat in the Thwaites and Pine Island glaciers sector of West Antarctica; a bed under the Recovery and Support Force glaciers that is hundreds of metres deeper than previously thought, making those ice sheets more susceptible to retreat; and the world's deepest land canyon below Denman Glacier in East Antarctica.

The new Antarctic bed topography product was constructed using ice thickness data from 19 different research institutes dating back to 1967, encompassing nearly a million line-miles of radar soundings. In addition, BedMachine's creators utilized ice shelf bathymetry measurements from NASA's Operation IceBridge campaigns, as well as seismic information, where available.

Mapping on Radar Soundings

Previous Antarctica mapping methods relying on radar soundings have been generally effective, with some limitations. As aircraft fly in a straight line over a region, wing-mounted radar systems emit a signal that penetrates the ice and bounces back from the point at which the ice meets the solid ground. Glaciologists then use interpolation techniques to fill in the areas between the flight tracks, but this has proven to be an incomplete approach, especially with fast-flowing glaciers.

Alternatively, BedMachine relies on the fundamental physics-based method of mass conservation to estimate what lies between the radar sounding lines, utilizing highly detailed information on ice flow motion from satellite data that dictates how ice moves around the varied contours of the bed. This technique was instrumental in the research team's conclusion regarding the true depth of the Denman trough.

Ice Dynamics and Ocean Circulation

By basing its results on ice surface velocity, in addition to ice thickness data from radar soundings, BedMachine is able to present a more accurate, high-resolution depiction of the bed topography. This methodology has been successfully employed in Greenland in recent years, transforming cryosphere researchers' understanding of ice dynamics, ocean circulation and the mechanisms of glacier retreat.

Applying the same technique to Antarctica is especially challenging due to the continent's size and remoteness, but, Morlighem noted, BedMachine will help reduce the uncertainty in sea level rise projections from numerical models.

BedMachine Antarctica is publicly available through the National Snow and Ice Data Center in Boulder, Colorado. Read more on the British Antarctic Survey website.
