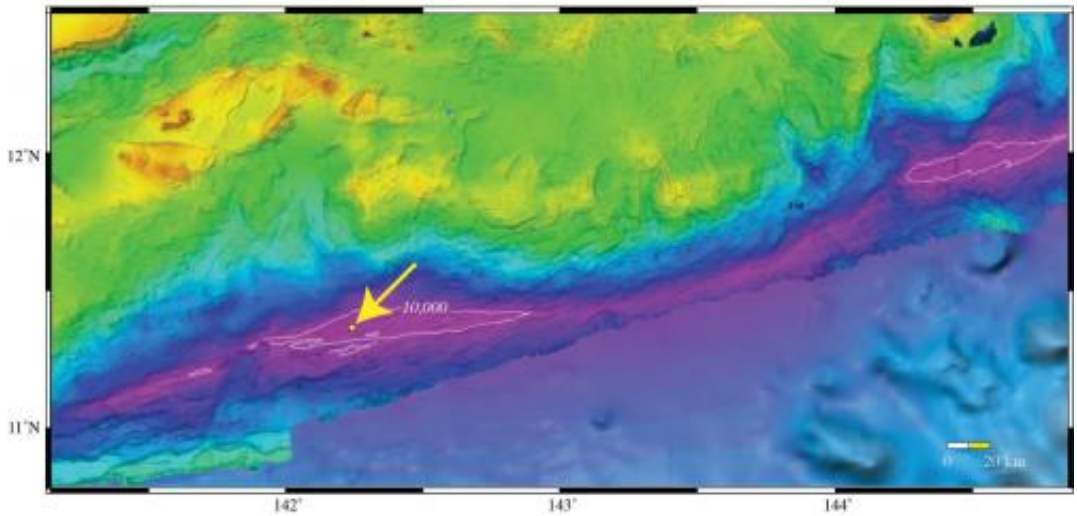
UNH ocean scientists shed new light on Mariana Trench

February 6 2012



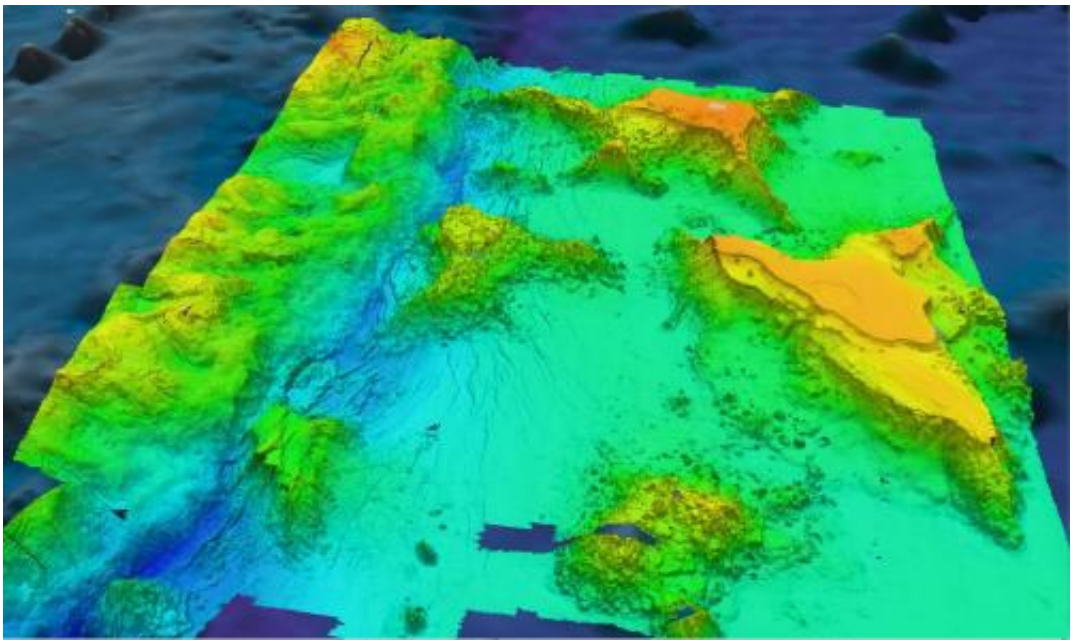
Map view of bathymetry of southern Mariana Trench Challenger Deep area. Arrow points to circle that identifies the location of the deepest sounding in the trench (10,994 meters). White contours are 10,000-meter isobath. Credit: University of New Hampshire Center for Coastal and Ocean Mapping/Joint Hydrographic Center

An ocean mapping expedition has shed new light on deepest place on Earth, the 2,500-kilometer long Mariana Trench in the western Pacific Ocean near Guam. Using a multibeam echo sounder, state-of-the-art equipment for mapping the ocean floor, scientists from the University of

New Hampshire Center for Coastal and Ocean Mapping/Joint Hydrographic Center found four "bridges" spanning the trench and measured its deepest point with greater precision than ever before.

Research professor James Gardner and affiliate professor Andrew Armstrong, both of UNH's Center for Coastal and Ocean Mapping/UNH-NOAA Joint Hydrographic Center (CCOM/JHC), presented their findings at the recent American Geophysical Union meeting in San Francisco, the world's largest annual meeting of Earth and planetary scientists.

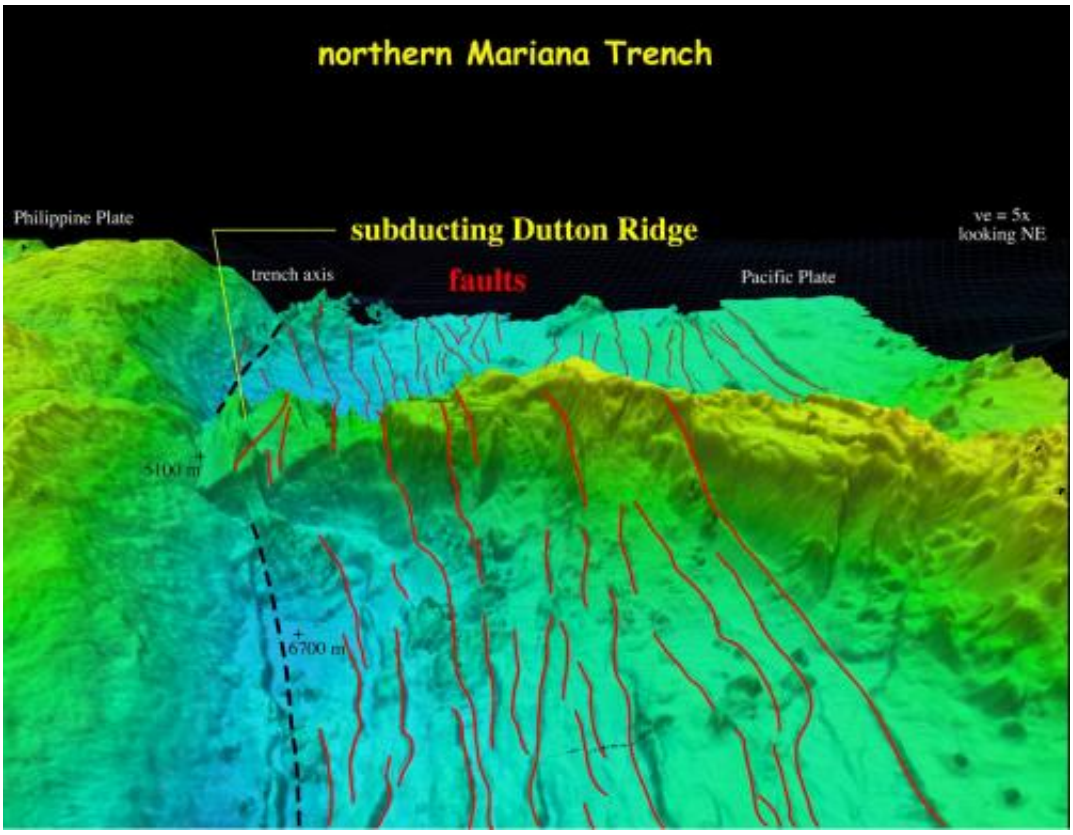
Mapping the entire Mariana Trench – approximately 400,000 square kilometers -- from August through October 2010, the researchers discovered four bridges spanning the trench and rising as high as 2,500 meters above its floor. While satellite images had suggested the trench might be spanned by one such ridge, Gardner says the mapping mission confirmed the existence of four such features. "That got me excited," he says.



Perspective view of bathymetry looking at the guyots and ridge approaching the Mariana Trench. Vertical exaggeration 5x. Credit: University of New Hampshire Center for Coastal and Ocean Mapping/Joint Hydrographic Center

The ridges are being formed as the 180-million-year-old Pacific and far younger Philippine tectonic plates collide. Because the ocean's crust cools as it ages, "the Pacific crust is much, much older, so it's diving underneath the Philippine plate," Gardner says. As seamounts on the Pacific plate are pulled beneath the Philippine plate, they are compacted against the wall of the trench, forming these ridges.

"It's incredibly complex geology. These seamounts haven't been completely subducted, they're getting jammed up against the plate," Gardner says. He surmises that the bridges are related to earthquake subduction zones, such as the one that caused the March 2011 earthquake in Japan.



Perspective view of bathymetry of Dutton Ridge as it is being subducted into the Mariana Trench. Numerous extensional faults (red lines) disrupt the seafloor and the ridge proper. Vertical exaggeration 5x. Credit: University of New Hampshire Center for Coastal and Ocean Mapping/Joint Hydrographic Center

The expedition also yielded the most precise measurement yet of Challenger Deep, the trench's (and the Earth's) deepest point, finding it to be 10,994 meters deep, plus or minus 40 meters. Calculated from thousands of depth soundings as well as detailed analysis of how the how the water column can alter the echo sounding signals, the new measurement is similar to other claims of the Challenger Deep's depth, some of which are deeper.

"When you're dealing with something that's 11 kilometers deep, you have to deal with inherent uncertainties in the system," says Gardner,

noting that Challenger Deep is deeper than Mount Everest is high.

Multibeam echo sounders measure depth by sending sound energy to the ocean floor then analyzing the returning signal. Mounted beneath a ship, the instruments produce a fan-shaped swath of coverage of the seafloor. The resolution of the resulting images, at one pixel to every 100 meters, is far more precise than other earlier measurement systems. Hydrographers and ocean mappers such as Armstrong and Gardner describe the process of mapping an area as like "mowing the lawn," making overlapping tracks over the area in question.

This mission to the Mariana Trench, the third and fourth cruises to that area by UNH scientists, was undertaken to gather data that can be used to support an extended continental shelf under Article 76 of the United Nations Convention of the Law of the Sea (UNCLOS). All data are publicly available on the CCOM website: http://www.ccom.unh.edu.

Provided by University of New Hampshire

Citation: UNH ocean scientists shed new light on Mariana Trench (2012, February 6) retrieved 26 April 2024 from https://phys.org/news/2012-02-unh-ocean-scientists-mariana-trench.html