

The Mariana Trough

In the Mariana region of the western Pacific Ocean, curving around the island of Guam, lies the Mariana Trench. Formed where the westward-moving Pacific tectonic plate subducts under the eastward-moving Philippine Sea plate, the trench is famous for being the deepest part of the sea, reaching depths of nearly 11 km. Yet the surrounding region, rife with exotic creatures and geological features, is equally fascinating.

This bathymetric three-dimensional image of the sea floor is based on data compiled from decades of surveying. The Mariana Trench is in the far lower right, in purple; the shallowest regions are red; and volcanic islands are green (the largest is Guam). The islands are the visible peaks of a long arc of mostly submerged volcanoes driven by subduction-generated heat. That submerged arc of fire is part of the Marianas Trench Marine National Monument established in 2009.

Contrary to what one might expect, the Mariana region is under tectonic tension. West of the volcanic arc is the so-called back-arc

region—the Mariana Trough—which is spreading as new crust forms along the zone plotted in white. Scientists from the National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory, the University of Washington, Oregon State University, and the Schmidt Ocean Institute focused on the back-arc region during a 27-day mission in late 2015 and discovered several new hydrothermal vent fields. This year NOAA returned for 69 days with its *Okeanos Explorer* vessel, equipped with dual remotely operating vehicles and live-streaming video, to follow up on the newly discovered vents, habitats, and features and to characterize benthic biological communities in advance of any possible deep-sea mining.

For more on the Mariana explorations, see http://www.pmel.noaa.gov/eoi/marianas_site.html and <http://oceanexplorer.noaa.gov/okeanos/explorations/ex1605/welcome.html>. (Map by Susan Merle, NOAA/PMEL.)

—Richard J. Fitzgerald

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