"A" Seamount

perched depression

Perspective view of several guyots on the Pacific Plate about to enter Mari-

ana Trench. The guyots surround a perched 40- x 50-km wide flat depression

that is 1500 m above the abyssal seafloor and 3000 m deeper than the guyot

surfaces.

Perspective view of central region of the Mariana Trench showing the traces of the extensional faults.

White dashed line is axis of the Mariana Trench

## The Mariana Trench: A new view based on multibeam echosounding

James V. Gardner (jim.gardner@unh.edu) and Andrew A. Armstrong (andya@ccom.unh.edu), Center for Coastal & Ocean Mapping-Joint Hydrographic Center, University of New Hampshire, Durham, NH (jim.gardner@unh.edu)

## **ABSTRACT**

The entire Mariana Trench, from its northern end at Dutton Ridge to the southwestern terminus at the Yap Trench, was mapped in 2010 using a Kongsberg EM122 12-kHz multibeam echosounder. The region ranges in depths from the shoreline at Guam to almost 11,000 m at the Challenger Deep. The northern part of the trench is receiving seamounts and guyots of the Magellan Seamount chain, whereas the southern section is receiving seafloor that carries the Caroline Ridge to the trench. The area immediately seaward of the trench where the Pacific Plate has bent downward toward the subduction zone has been broken by a series of subparallel horst and graben structures generated by extension on the bending upper surface of the Pacific Plate. Four bathymetric "bridges" span across the trench axis and extend from the Pacific Plate to the inner wall of the trench. The bridges stand as much as 2500 m above the trench axis and are composed of Latest Jurassic to Early Cretaceous accreted seamounts and guyots of the Magellan Seamount chain that are in the process of breaking up and being subducted beneath the Philippine Plate. Only two seamounts of the Caroline Ridge are in the vicinity of the trench and they both presently reside on the outer trench wall. The faults of the horsts and grabens have fractured the seamounts and guyots within the trench depression seaward from the axis outward for about 80 km, but within ~5 km of the trench axis the faults have reactivated to compressional thrust faults. The faults tend to parallel the axis of the trench until the immediate vicinity of an accreting seamount or guyot where the faults bend inward toward the trench axis, as has been observed in many other trenches.

Most of the accreted seamounts and guyots are not associated with embayments or reentrants on the inner trench wall, as has been documented in the Middle America and Japan Trenches, perhaps because there is not a large accretionary prism that extends seaward of the forearc. The one exception is a large seamount of the Caroline Ridge that has been fractured into several sections, some of which appear to be mostly subducted, that are associated with a 30 km embayment landward from the trench axis. However, there are reentrants along the inner trench wall but without bathymetric expression of an associated subducting seamount or guyot. These reentrants may mark zones where seamounts and guyots have been completely consumed into the trench. There is no evidence from the acoustic backscatter of sediment filling by debris flows and other

scatter to be ponded sediment in bathymetric lows that are surrounded by diapirs.

## failure deposits along the entire trench axis, although the inner trench wall has numerous scarps from wall The forearc area has numerous features that resemble diapirs with what appears from the acoustic back-An analysis of the individual soundings within Challenger Deep shows the deepest depth of the Mariana Trench is 10,994 m (2σ ±40 m), based on numerous soundings and sound-speed profiles collected during the cruise in the immediate area. The location of the deepest depth does not coincide exactly with published claims of the deepest depth, although many of the claims are within a few kilometers of the 10,994 m depth. **Location Map**

The deepest depth measured in the *Challenger Deep* of the Mariana Trench was made in 2010 and is 10,994 m. This is the deepest documented depth of the trench, although 11,034 m was by Tairn et al. (2004) from the RV Vityaz 1957 cruise.

