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Purpose of the Dive

Benthic Exploration: This dive investigated a potential “petit-spot” volcano. The term was coined by Japanese researchers who first discovered them (Hattori et al., 2001) east of the Japan Trench on the Cretaceous (older than 117 million years) seafloor of the subducting Pacific tectonic plate. Such volcanic edifices are young (less than or about 5 million years old). They erupt alkalic lava (i.e., lava relatively high in Na and K compared with typical mid-ocean ridge basalt), from small-degree partial melts of the Pacific Ocean mantle. The mechanism for the melt generation is under debate. They form along fractures in the subducting Pacific Plate that are generated as the plate bends prior to being subducted at the Japan Trench. Finding one near the Mariana Trench would be the first ever identified anywhere on Earth other than near the Japan Trench, suggesting that young volcanism may be widespread near trenches on subducting tectonic plates.

Midwater Exploration: The midwater of the oceans (500 m to our vehicle maximum of 6000 m) is the largest biome on Earth and unexplored. The quality of video obtained through the ROV and the onboard instrumentation represent a unique capability to explore this part of the ocean. At the conclusion of the dive, ROV Deep Discoverer conducted midwater exploration over 5 transects from 1200 m to 800 m. The purpose of this portion of the dive was to discover what lives in the water column in this area adjacent and above of a deepwater volcano.

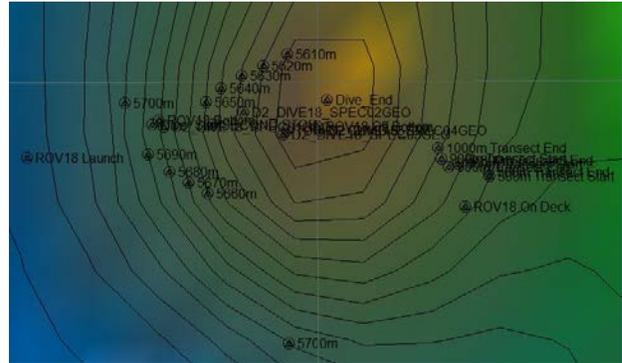
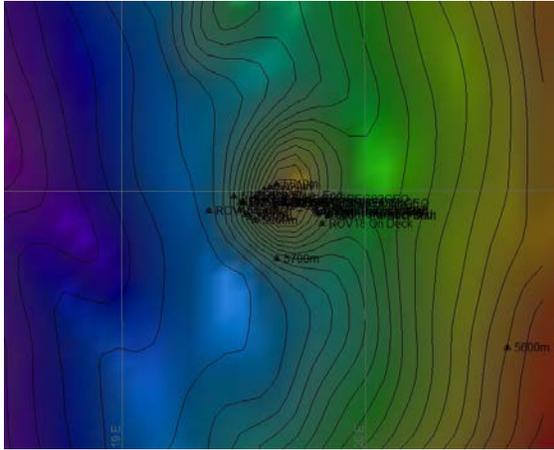
Description of the Dive:

The dive started at 5692 m on a sedimented surface with a lot of subangular to angular rocks scattered on the surface. SPEC01GEO was collected among the scattered boulders, selected because it was angular and had a very thin coating of the black MnO crust. Thus, it was likely not exposed to seawater for as long as the thickly encrusted rocks on the large guyots nearby. Sediment adhering to the sample was very fine-grained, and the ROV readily kicked up a cloud of the sediment. As the ROV moved farther up the slope (at ~ 23:52 Z) there were a number of large angular blocks with thin MnO coating. In areas of sediment, the sea floor also has pebble- and cobble-sized rocks scattered over the surface, suggesting that the rocks are recently (geologically) deposited on the sea floor. SPEC02GEO was collected from a large boulder that had broken open and left smaller fragments on the slope just below it. There was some white staining (potentially hydrothermal?) on the rocks at 5848 m depth as well as some rocks that looked platy, as well as the more angular ones. A few of the larger boulders the ROV passed over had a portion of their surface heavily coated with MnO and the rest only thinly coated. Tongues of talus, mainly cobble-sized, and smaller rock fragments were seen toward the upper flank of the edifice. Much of this material showed white staining and thin white veins in interstices between the rubble. At about 30 m from the summit we saw layered, graded beds. The layers in the graded beds included pebble-sized angular fragments (possibly volcanoclastic deposits in ash layers?). On the initial attempt to collect the last rock sample, at the summit of the edifice, the rock crumbled in the manipulator. SPEC04GEO was collected from this same area that appeared to be a partially indurated sedimentary rock with a thin MnO coating.

Many of the animals documented on this dive were mobile, with the exception of some carnivorous (new records and possibly new species) and hexactinellid sponges (including a lavender Corbitellinae), a few anemones, some tube-dwelling polychaetes, a brisingid seastar with parasites (gastropods and perhaps barnacles), a long (10 cm) scaleworm, and an equally long and translucent holothurian. Overall, there were more mobile fauna than we expected to see. Abyssopelagic crustaceans (mysids, shrimp, and long-legged isopods) and polynoid polychaetes were fairly common, and a chaetognath (arrow worm) at 5575 m—poised to grab something to eat. A literature check is still underway, but this might be the deepest an arrow worm has been found. There were quite a few cusk eels; the one with the flattened elongate snout is a *Penopus* sp., the previous deepest record for which is 3500 – 4000 m! The benthic portion of the dive concluded with amazing videos of an acorn worm- verifying the source of the fecal trails that we saw nearby. This may a new depth record for an acorn worm, too!

The midwater dive was spectacular: chaetognaths, forams, radiolarians, hydromedusae, ctenophores, larvaceans, salps, siphonophores, and a possible cephalopod sighting! The shrimp with extensions on its antennae that looked like it was holding chopsticks and the stunning hydromedusa with tentacles that looked like vertical Christmas lights were highlights of the midwater dive.

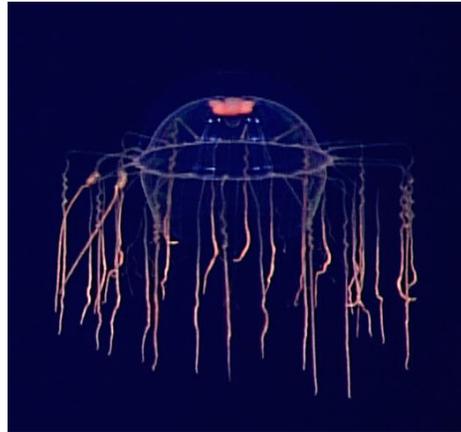
Overall Map of ROV Dive Area**Close-up Map of Main Dive Site**



Representative Photos of the Dive



This outcrop of rocks shows white staining that on close inspection proved to be a precipitate laid down in the interstices between individual angular rock fragments exposed in the outcrop. We speculated that the white material may be hydrothermal deposit.



One of the most beautiful of the midwater organisms during the dive, this unknown hydromedusa captivated us.

Samples Collected

Sample ID	SPEC01GEO
Date (UTC)	20160704
Time (UTC)	234451
Depth (m)	5693.36
Temperature (°C)	1.59
Field ID(s)	ROCK
Comments	32x19.5x18.5cm Igneous rock.



Sample ID	SPEC02GEO	
Date (UTC)	20160705	
Time (UTC)	005711	
Depth (m)	5607.5	
Temperature (°C)	1.59	
Field ID(s)	ROCK	
Comments	16x10x9cm. Igneous rock.	
Sample ID	SPEC03BIO	
Date (UTC)	20160705	
Time (UTC)	014054	
Depth (m)	5565.37	
Temperature (°C)	1.61	
Field ID(s)	CLADORHIZIDAE ON ROCK	
Comments	Three sponges on the same rock.	
Sample ID	SPEC04GEO	
Date (UTC)	20160705	
Time (UTC)	022412	
Depth (m)	5542.01	
Temperature (°C)	1.56	
Field ID(s)	ROCK	
Comments	18x13x10cm. Sedimentary rock	
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