

## Okeanos Explorer ROV Dive Summary

Dive Information			
Dive Map			
Site Name	Rose Atoll Marine Sanctuary Deep (ROV on bottom at 2528 m water depth)		
ROV Lead(s)	Karl McLetchie		
Expedition Coordinator(s)/ Mapping Lead	Kelley Elliott / Meme Lobecker		
Science Team Lead(s)	Santiago Herrera (Biology) and Matt Jackson (Geology)		
General Area Descriptor	Samoa region, Rose Atoll (East-flanking ridge extending to east of Rose Atoll)		
ROV Dive Name			
Cruise	EX1702		
Leg			
Dive Number	03		
Equipment Deployed			
ROV	Deep Discoverer (D2)		
Camera Platform	Seirios		
ROV Measurements	<input checked="" type="checkbox"/> CTD	<input checked="" type="checkbox"/> Depth	<input checked="" type="checkbox"/> Altitude
	<input checked="" type="checkbox"/> Scanning Sonar	<input checked="" type="checkbox"/> USBL Position	<input checked="" type="checkbox"/> Heading
	<input checked="" type="checkbox"/> Pitch	<input checked="" type="checkbox"/> Roll	<input checked="" type="checkbox"/> HD Camera 1
	<input checked="" type="checkbox"/> HD Camera 2	<input checked="" type="checkbox"/> Low Res Cam 1	<input checked="" type="checkbox"/> Low Res Cam 2

	<input checked="" type="checkbox"/> Low Res Cam 3	<input checked="" type="checkbox"/> Low Res Cam 4	<input checked="" type="checkbox"/> Low Res Cam 5
	<input checked="" type="checkbox"/> LSS	<input checked="" type="checkbox"/> ORP	
Equipment Malfunctions	Port manipulator not onboard		
ROV Dive Summary (from processed ROV data)	In Water:	2017-02-18T19:24:24.316000 14°, 32.489' S ; 168°, 04.824' W	
	Out Water:	2017-02-19T03:34:30.337000 14°, 31.732' S ; 168°, 05.048' W	
	Off Bottom:	2017-02-19T02:10:23.143000 14°, 32.235' S ; 168°, 04.934' W	
	On Bottom:	2017-02-18T20:57:16.077000 14°, 32.268' S ; 168°, 04.780' W	
	Dive duration:	8:10:6	
	Bottom Time:	5:13:7	
	Max. depth:	2528.0 m	
Special Notes			
Scientists Involved (please provide name, location, affiliation, email)	Abby Lapointe, University of Hawaii Amanda Netburn, NOAA OER Amy Baco-Taylor, Florida State University Andrea Quattrini, Harvey Mudd College Asako Matsumoto, PERC, Chiba Institute of Technology, Japan Andrew Reinhard, UC Santa Barbara Brian Greene, Association for Marine Exploration Chris Mah, NMNH Smithsonian Institution Christopher Kelley, University of Hawaii Deborah Glickson, National Academies of Sciences, Engineering, and Medicine Diva Amon, University of Hawaii at manoa Matthew Jackson, UC Santa Barbara Michael Parke, NOAA PIFSC Michael Vecchione, NMFS Natalie Summers, University of Hawaii at Manoa Nicole Morgan, Florida State University Peter Auster, Mystic Aquarium & University of Connecticut Santiago Herrera, Lehigh University Scott France, University of Louisiana at Lafayette Sonia Rowley, University of Hawai'i at Manoa Steve Auscavitch, Temple University Tara Harmer Luke, Stockton University Taylor Heyl, Woods Hole Oceanographic Institution Timothy Shank, Woods Hole Oceanographic Institution		



	Tina Molodtsova, P.P. Shirshov Institute of Oceanology RAS
Purpose of the Dive	<p>The goal of this dive was to generate baseline information on deep sea habitats and biological communities, particularly deep-sea coral communities, to better understand their diversity and distribution and support management needs of the Rose Atoll Marine National Monument.</p> <p>From a geological standpoint, Rose Atoll is thought to be an older seamount linked to the Cook-Austral Islands instead of Samoa. Malulu to the west (to be sampled in a later dive during this cruise) and Rose Atoll are key in defining the Cook-Austral hotspot tracks back in time, and as such an age on a volcanic rock is needed from Rose Atoll. Without an age, it is not possible to truly define plate motion for the time frame represented by this volcano.</p>
Description of the Dive	<p>The dive track is on the large ridge (rift zone) extending away from the east side of Rose Atoll. The dive track was designed to start on the south side of the ridge, then move north up the side of the ridge to the ridge crest. Upon reaching the ridge crest, the ROV would turn and head upslope to the west, following the ridge crest. We did not have enough time to continue upslope along the ridge.</p> <p><b>The following geological description provides a chronological summary of the major geological features, or changes in the geology of the ocean floor, over the course of the dive:</b></p> <p>The first view of the ocean floor revealed abundant individual ferromanganese nodules, covering entire field of view (i.e., no lava flows or lava pillows were visible). Nodules vary from 5 to 50 cm in diameter, and the narrow spaces between nodules were filled with light colored sediment, possibly carbonate from the reef. We moved 5 or 10 m in search of a sufficiently large, loose rock that we could collect; the collected rock was from this boulder field, perhaps 10 m from on bottom site; it is a ferromanganese-encrusted rock, 15 to 20 cm in diameter (sample ID is D2_DIVE03_SPEC01GEO). As we moved along, the geology was unchanging until 21:40:00 (UTC), when the boulder field of nodules ended and the ROV arrived on top of what appeared to be, morphologically, a lava flow that is encrusted in ferromanganese; some boulders were present on top of the flow. However, at 22:08:00, the geology changed again and there were more boulders than flow features; the second (and last) geologic sample was a loose boulder from this area (D2_DIVE03_SPEC02GEO), roughly twice the size of the first boulder. At 22:23:00 the ROV encountered the largest outcrops thus far, consisting of flows (with pillow basalt features) with scattered boulders on the outcrops. At 22:23:35 the ROV went over a large volcanic flow with no boulders and very little sediment; the flows were replete with textbook pillow structures. At 22:53:00, the ROV passed over similar flows with scattered boulders, but a larger amount of sediment existed between the boulders. At 22:55:00 the morphology of the flows became more varied, and included pillow textures</p>



interspersed with rougher flow textures, but the rough textures may actually be talus deposits (covering pillow flows) that were cemented with ferromanganese deposits. At 22:59:00, the ROV camera illuminated some truly beautiful pillow structures; the ROV camera zoomed in on one specific pillow that had broken open, exposing the interior. At 23:04:00, the ROV was well into an ascent up the side of the east-flanking ridge of Rose atoll; the slope was approximately 30 degrees and composed of outcropping pillows, devoid of sediment cover, that filled the entire field of view. But 23:27:00, the slope increased to 40 degrees, and continued to be entirely composed of pillow basalts. At 23:56:00, the view was completed covered with ropy lava textures, with very little sediment cover. At 00:11:00, the geology in the field of view of the ROV cameras transitioned to pillows with some pillows, and the sediment cover increased; as with all sediment cover observed in the dive, the sediment is light in color and appears to be sandy in texture. At 00:23:00, pillows fill the entire field of view, and no boulders are present; the topography is highly varied, and 5 to 10 meter vertical walls are present. At 00:29:18, a large block (perhaps 20 x 15 x 20 m, estimated) composed of pillow flows came into view and the block does not appear to be attached to the flows below; this large block may be a product of a large landslide? At 00:37:43, the flow edge terminates and the view is dominated by boulders with quantities of sediment between the boulders. Another large block of basalt (perhaps 5 x 5 x 5 m, estimated) appeared in the field of view, and is one of several viewed thus far. From 00:48:00 to 00:56:00, there was large variations in topography with pillow lavas extending to the limit of the field of view. At 01:07:00, it is noted that for the past hour or more, many overhanging ledges have been observed, many of which appear to be large dislodged block of basalt. At 01:23:00, another large possible block (perhaps 10 x 10 x 10, estimated) became the target of two biology samples (the second and third biology samples); several attempts were made to sample rocks on this block, but it was not possible to dislodge the these samples.

**The biological perspective is as follows:**

At the landing site, no apparent sessile fauna attached. Observed a swimming holothurian sea cucumber at distance. Collected one of the basalt cobbles, no apparent fauna attached on it (D2\_DIVE013\_SPEC01GEO SF, 20170218 2120, 2538m).

Moved slowly uphill making detailed observations. Observed several ophiuroids, two different kinds of comatulid crinoids, a dandelion siphonophore, two different kinds of sea cucumbers of on the seafloor, a new species of Goniasterid seastar, and several carnivorous cladorhizid sponges, and a couple of other glass sponges (also observed several large dead sponge skeletons covered with Mn crust, likely very old). Collected one of the basalt cobbles, no apparent fauna attached on it (D2\_DIVE013\_SPEC02GEO SF, 20170218 1013, 2513m).

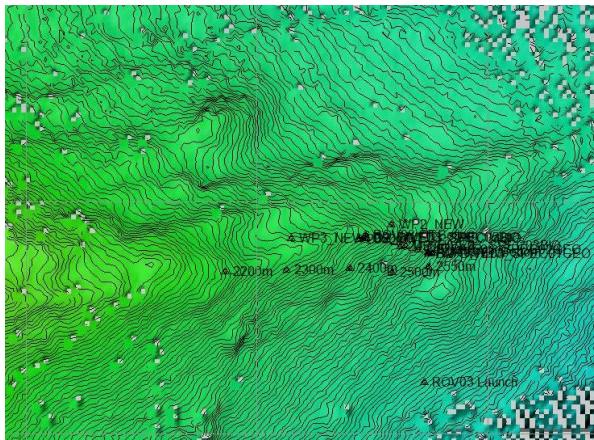
Observed first coral at 2497m, a bamboo coral *Lepidisis?* and also a golden coral *Chrysogorgia* with squat lobster associate. At ~2480 (LAT :-14.53773, LON : -168.08028, DEPTH :2474.5984m, TEMP : 1.88585C, SAL : 34.66392 PSU, DO : 4.43871 mg/L ) we observed a higher abundance and diversity of corals: Bamboos (*Lepidisis?*), *Chrysogorgia* with squat lobsters, *Pleurogorgia* with tube hydroids and anemones, *Paranthipathes* black corals as well as stalked glass sponges.

Encountered area of much steeper slope at ~2460m, currents increased in strength (from the NE and downwelling). Collected a *Lepidisis* bamboo coral at 2448m (LAT :-14.53751, LON : -168.08059, DEPTH :2448.8970m, TEMP : 1.87727C, SAL : 34.66145 PSU, DO : 4.45953 mg/L).

We continued to climb over steep terrain with significant currents. Benthic community remained relatively constant, composed of Bamboos (*Lepidisis?*), *Chrysogorgia* with associates, *Pleurogorgia* with tube hydroids, *Paranhipathes* black corals. Several dead sponge stalks. Also observed a large branching bamboo colony (had a predatory seastar on it) and a couple of smaller ones (likely *Jasonisis*) < 2415m.

Observed large loose boulders and a reduced abundance of megafauna (at ~2360 m). Many fossil/dead sponges covered with Mn (likely very old). Collected the top of one of this sponges (D2\_DIVE03\_SPEC04BIO. LAT :-14.53725, LON : -168.08212, DEPTH :2349.7875m, TEMP : 1.92638C, SAL : 34.66007 PSU, DO : 4.46892 mg/L). Also collected a black coral *Parantipathes* sp (D2\_DIVE03\_SPEC05BIO. LAT :-14.53729, LON : -168.08223, DEPTH :2348.1378m, TEMP : 1.85799C, SAL : 34.66417 PSU, DO : 4.52146 mg/L). Attempted to collect an unknown chrysogorgiid (*Pseudochrysogorgia?* with squat lobster), however strong currents kept pushing Seiros and prevented the collection. Dive ended here.

Overall Map of the ROV Dive Area



Close-up Map of Main Dive Site



Representative Photos of the Dive



EX1702\_IMG\_20170218T205806Z\_ROVHD.jpg

Abundant individual ferromanganese nodules, covering entire field of view (i.e., no lava flows or lava pillows were visible). Nodules vary from 5 to 50 cm in diameter.



EX1702\_IMG\_20170219T002443Z\_ROVHD.jpg

Anemone and *Chrysogorgia* golden coral on ferromanganese encrusted lava flow



### Samples Collected

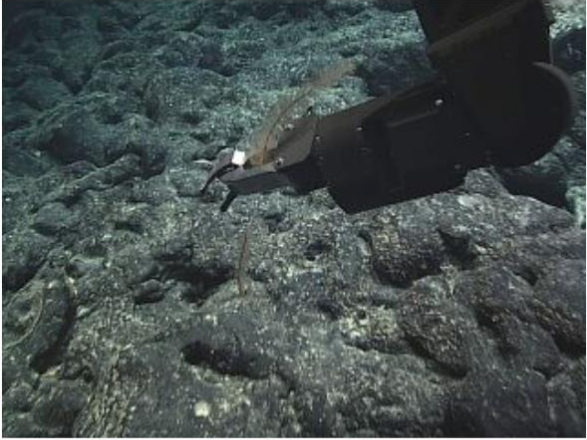
#### Sample

Sample ID	D2_DIVE03_SPEC01GEO	<p>EX1702_IMG_20170218T211747Z_ROVHD.jpg</p>
Date (UTC)	20170218	
Time (UTC)	21:19:45	
Depth (m)	2527.8539	
Temperature (°C)	1.91257	
Field ID(s)	Mn encrusted rock (15-20 cm diameter)	
Comments	No associated fauna on this rock	

#### Sample

Sample ID	D2_DIVE03_SPEC02GEO	
Date (UTC)	20170218	
Time (UTC)	22:13:43	
Depth (m)	2502.4091	
Temperature (°C)	1.88699	

Field ID(s)	Fe-Mn encrusted rock	
Comments	No associated fauna on this rock	
<b>Sample</b>		
Sample ID	D2_DIVE03_SPEC03BIO	 <p>EX1702_IMG_20170218T232257Z_ROVHD.jpg</p>
Date (UTC)	20170218	
Time (UTC)	23:24:52	
Depth (m)	2448.8971	
Temperature (°C)	1.86345	
Field ID(s)	Lepidisis	
Comments	There is an error in the sample name "D2_DIVE03_SPEC03GEO". It should be "D2_DIVE03_SPEC03BIO". Upon recovery from ROV biobox discovered a polychaete associate.	
<b>Sample</b>		
Sample ID	D2_DIVE03_SPEC04BIO	 <p>EX1702_IMG_20170219T013136Z_ROVHD.jpg</p>
Date (UTC)	20170219	
Time (UTC)	1:33:57	
Depth (m)	2349.8508	
Temperature (°C)	1.90092	
Field ID(s)	Dead sponge	
Comments	Upon recovery from ROV biobox discovered glass sponges, hydroids, polychaetes, barnacles and anemone associates.	

Sample	
Sample ID	D2_DIVE03_SPEC05BIO
Date (UTC)	20170219
Time (UTC)	2:08:40
Depth (m)	2348.1395
Temperature ( °C)	1.86015
Field ID(s)	Parantipathes
	
	EX1702_IMG_20170219T020602Z_D2_DIVE03...
Comments	Upon recovery from ROV biobox discovered a shrimp associate.
Sample	
Sample ID	
Date (UTC)	
Time (UTC)	
Depth (m)	
Temperature ( °C)	
Field ID(s)	
Comments	A 3 <sup>rd</sup> geological sample was not obtained.

**Please direct inquiries to:**

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