

## Okeanos Explorer ROV Dive Summary

Dive Information			
Dive Map			
Site Name	"Leoso" seamount, ROV on bottom at 3770 m (-12.64986505, -167.27212505)		
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	North Samoan region, Near southern margin of Manihiki Plateau		
ROV Dive Name			
Cruise	EX1702		
Leg			
Dive Number	05		
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



	<p>hotspot, not Samoa. Samples from this seamount are key in defining the Society hotspot tracks back in time, and as such an age on a volcanic rock is needed from this seamount. Without an age, it is not possible to truly define plate motion for the time frame represented by this volcano.</p> <p>From the biological perspective this dive has the potential to provide new depth records for several species as well the discovery of new species. Very little work has been done in the Central Pacific at these depths on seamounts. We aimed to collect information that will inform the biogeographic identity of the communities at abyssal depths in this region.</p>
Description of the Dive	<p>The new seamount explored in this dive, tentatively called “Leoso” seamount, straddles the boundary between the American Samoa EEZ and the Cook Islands EEZ. The seamount had not been mapped before. Thus, before diving, we mapped a portion of the southeastern half of the volcano. The seamount appears to be comprised of two distinct structures: The base of the seamount is composed of a larger flat-topped guyot; on top of this guyot is a smaller volcanic structure that is consistent with being a rejuvenated stage of volcanism on this seamount (notably, the rejuvenated structure is also flat-topped). The dive track was designed to start midway up a steep portion of the southeast margin of the rejuvenated volcanic structure. The ROV will climb up this margin with the goal of reaching the flat-topped portion of the rejuvenated volcanic structure.</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><i>01:05:00.</i> The first view of the ocean floor revealed ferromanganese encrusted surface, possibly a lava flow; scattered sediment represents &lt;2% of cover, and some small pebbles and cobbles (up to approximate 10 cm, estimate), all ferromanganese covered, are scattered on the surface of this flat area. One of these ferromanganese cobbles was targeted as the first geologic sample of the dive (a seastar attached to the cobble, and was placed in the biobox onboard the ROV): D2_DIVE05_SPEC01GEO</p> <p><i>01:11:20.</i> The smoother ferromanganese substrate visible at the beginning of the dive is now absent, and is replaced with a substrate consisting of ferromanganese-encrusted pebbles and cobbles.</p> <p><i>01:19:47.</i> The substrate in the field of view is now composed of 50% pebble and cobbles and 50% flow structures, all of which are ferromanganese covered; sediment cover is &lt;5%. This sediment, like all sediment observed to this point (and for the rest of the dive), is light colored and may be carbonate in composition.</p> <p><i>01:31:54.</i> The substrate in the field of view consists of 75% flow structures and 25% cobbles and pebbles. We identified a 12 cm cobble with a dead sponge attached, and this became the second geological sample of the collection: D2_DIVE05_SPEC02GEO. A rounded cobble (5 -10 cm) of light colored (off white) pumice was observed 1 to 2 meters uphill of the second geologic sample. The pumice is relatively unaltered (and has little to no ferromanganese cover) compared to the surrounding rocks, and is unlikely to have originated from this seamount; we consider it more likely that this pumice has a recent origin at a distal volcano and the pumice floated to the site of Leoso seamount before becoming waterlogged, thus sinking and coming to rest on the flanks of Leoso</p>



seamount.

*01:39:21.* Large flow structures now fill most of the upper portion of the field of view, with large cobbles (up to 30 cm) positioned in the lower part of the field of view. A second piece of pumice, darker in color than the first, was identified approximately 0.5 m from the location of a large white squat lobster. This pumice is like to have a similar origin as the pumice described above.

*01:45:32.* The ROV is now moving up a slope of perhaps 15 degrees. The field of view is dominated by a ferromanganese covered basalt flow that and has relatively few boulders or cobbles.

*02:07:25.* The ROV is not moving up a slope of perhaps 15 to 20 degrees. The substrate is composed primarily of smooth, ferromanganese covered flows. Intermittently the smooth basaltic surface breaks up onto pebbles and cobbles.

*02:12:23.* The lava flow structures breaks up into boulders (up to 1 m in diameter) and cobbles. Nonetheless, a portion of the lava flow is still visible in the periphery of the field of view. Sediment cover is still minimal.

*02:17:30.* The ROV is now moving up a slope of approximately 25 degrees. The slope is covered with ferromanganese deposits. The slope is smooth and mostly devoid of loose rock.

*02:28:30.* The ROV is still situation on a relatively steep slope (25 degrees) that consists of a lave flow structure that is smooth and ferromanganese encrusted.

*02:34:54.* The lava flow comes to an abrupt end and the western boundary of the lava field is defined by a gully running down the slope; the gully is filled with cobbles and boulders, all of which likely rolled downslope. At this point, the ROV is only 50 to 100 m from the summit of this seamount structure, so the rocks in the gully could not have rolled far downhill. A cobble from this gully was selected as the third geological sample of this dive: D2\_DIVE05\_SPEC04GEO.

*02:45:00.* A lava flow with possible pillow structures dominates the view; only small (<10 cm) ferromanganese nodules are present on the flow, but they are not abundant; the sediment cover continues to be minimal (<2%).

*02:50:07.* The slope is steep (30 degrees, perhaps), and covered with smooth, ferromanganese encrusted pillow basalts; small ferromanganese nodules (<5 cm) are present present (but not abundant), and sediment covers <2% of the surface.

*03:12:52.* There is a geological transition to a steeper slope (perhaps 40%). Pillow basalt structures are ubiquitous, and <10 cm ferromanganese nodules are present in abundance in pockets between pillows structures. Sediment covers perhaps 10% of the rock surface.

*03:23:34.* The ROV reached the flat top of the rejuvenated volcanic structure. The flat topped nature of this seamount structure—as imaged by the multibeam sonar data—is extremely clear as we summit the seamount and traverse across the flat top: the field of view is dominated by flat, smooth ferromanganese encrusted surface. The sediment cover is much greater (maybe 30%), but the sediment cover is quite thin (estimate at 1 or 2 mm), except in pockets in cracks in the lava flow where the sediment thickness is thicker; ripple patterns are present in the sediment, possibly generated by north-south (or south-north) currents. Only rare ferromanganese encrusted pebbles are present, but not cobbles or boulders.

**The biological perspective is as follows:**

Landed at LAT :-12.64991, LON : -167.27145, DEPTH :3768.0019m, TEMP : 1.48650C, SAL : 34.69233 PSU, DO : 4.86619 mg/L. Observed gentle sloping terrain 30-40 degrees, all bare rock encrusted by ferromanganese crust, some loose cobbles. Collected a cobble D2\_DIVE05\_SPEC01GEO 00:57 with a brisingid seastar



on it. Observed black animal tracks (clean form sediment) on rocks, possibly made by a holothurian or snail (none observed). Saw many small ophiuroids sitting on bare rock. Observed several individuals of stalked glass sponge (*Bolosoma*) with sessile ctenophore attached to it. Also observed other non-stalked glass sponges (*Corbitellinae?*) with folds/lobes on wall and a central barrel. Imaged a beautiful specimen of *Branchiocerianthus* stalked hydroid. Observed asymmetric yellow urchin (*Pilematechinus?*). Several other glass sponges, including *Hyalonema?* (potbelly sponge, brown attachment) were also observed.

Collected a rock at 01:33 (D2\_DIVE05\_SPEC02GEO rock starboard rock box LAT :-12.64930, LON : -167.27184, DEPTH :3748.1127m, TEMP : 1.45541C, SAL : 34.69386 PSU, DO : 4.96605 mg/L). Observed several live and dead stalked glass sponges (*Bolosoma*) in this area. Dead stalks were commonly observed. Many of them colonized by hydroids, barnacles, other sponges and anemones.

Attempted collection of a new species of cookie star. But failed ☹️. Stalked glass sponge (*Bolosoma*) was to be the dominant suspension feeder on this wall (3740m). Observed a couple of *Nematocarcinus* shrimp and potbelly sponges. Collected of a holasteroid urchin possibly *Pilematechinus* at 02:25 (D2\_DIVE05\_SPEC03BIO, LAT :-12.64945, LON : -167.27185, DEPTH :3727.6779m, TEMP : 1.47076C, SAL : 34.68682 PSU, DO : 4.90378 mg/L).

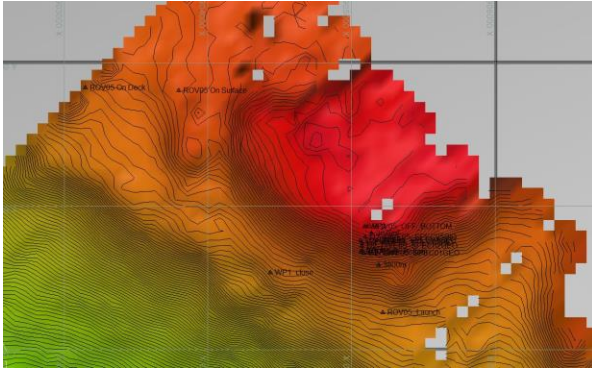
Further along in the dive track along the southern slope of the seamount we encountered a chute with many cobbles and broken down pieces of rock. Collected rock D2\_DIVE05\_SPEC04GEO at 02:38 (LAT :-12.64917, LON : -167.27171, DEPTH :3720.8418m, TEMP : 1.46509C, SAL : 34.69407 PSU, DO : 4.93543 mg/L). Smooth lava flows continue to be dominant substrate, with more dead and alive stalked sponges.

First and only observation of a coral in this dive, the black coral *Bathypathes cf. patula* at 02:49. Collected at 03:03 D2\_DIVE05\_SPEC05BIO. Had to move from collection site before putting in biobox because ship had completed a move. (LAT :-12.64919, LON : -167.27166, DEPTH :3696.1976m, TEMP : 1.45622C, SAL : 34.69564 PSU, DO : 4.91035 mg/L)

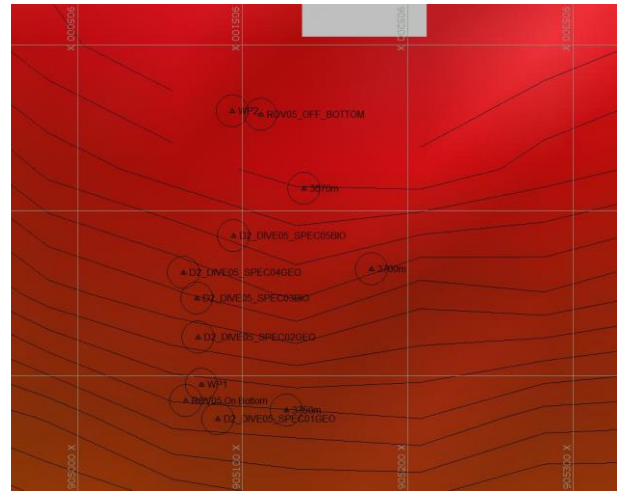
Substrate changed near the edge of the seamount top. Abundant ferromanganese nodules cemented. Not as smooth lava flows. At the top of the seamount we see smooth surface of ferromanganese crust, very little to no fauna, some stalked sponges. Increasing sediment cover. Rippled thin layer of sediments on the top of seamount/guyot, indicate a S-N direction of predominant currents.

03:43:13 End of dive after reaching area of WP2.

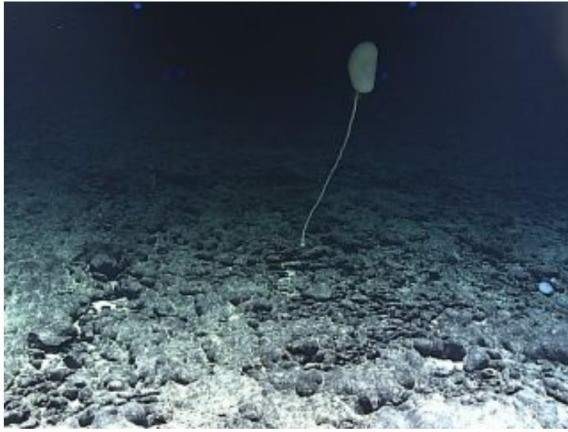
Overall Map of the ROV Dive Area



Close-up Map of Main Dive Site



Representative Photos of the Dive



EX1702\_IMG\_20170221T020746Z\_ROVHD.jpg

Stalked glass sponge (*Bolosoma*) attached to ferromanganese crust covering cobbles and old lava flows.



EX1702\_IMG\_20170221T033203Z\_ROVHD.jpg

Thin layer of sediment on top of guyot seamount showing ripple patterns likely created by northward moving currents. Several stalked glass sponges visible.

Samples Collected


Sample

Sample ID	D2_DIVE05_SPEC01GEO
Date (UTC)	20170221
Time (UTC)	0:57:31
Depth (m)	3770.4671



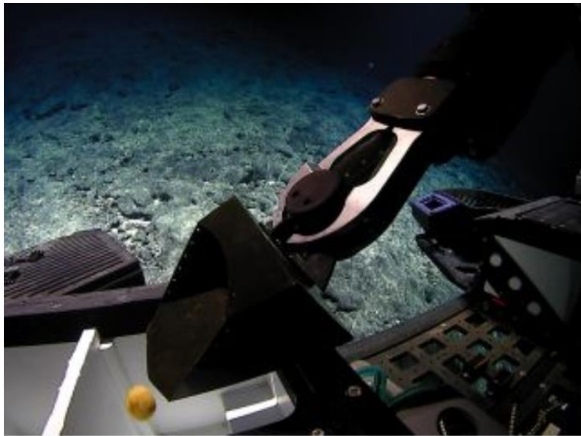
Temperature ( ° C)	1.45931	
Field ID(s)	Rock (with brisingid)	
Comments		

### Sample

Sample ID	D2_DIVE05_SPEC02GEO	
Date (UTC)	20170221	
Time (UTC)	1:38:45	
Depth (m)	3747.7579	
Temperature ( ° C)	1.45278	
Field ID(s)	Rock	
Comments		


EX1702\_IMG\_20170221T013414Z\_ROVHD.jpg

### Sample

Sample ID	D2_DIVE05_SPEC03BIO	
Date (UTC)	20170221	
Time (UTC)	2:27:03	
Depth (m)	3726.8877	
Temperature ( ° C)	1.47465	
Field ID(s)	<i>Pilematechinus ?</i>	
Comments	Urchin	

EX1702\_IMG\_20170221T022616Z\_D2\_DIVE05\_SPEC03...

### Sample

Sample ID	D2_DIVE05_SPEC04GEO	
Date (UTC)	20170221	
Time (UTC)	2:38:27	

Depth (m)	3718.4301	
Temperature ( ° C)	1.45708	
Field ID(s)	Rock	
Comments		

### Sample

Sample ID	D2_DIVE05_SPEC05BIO	
Date (UTC)	20170221	
Time (UTC)	3:03:35	
Depth (m)	3682.9185	
Temperature ( ° C)	1.46343	
Field ID(s)	<i>Bathypathes?</i>	
Comments	Black coral	

EX1702\_IMG\_20170221T025659Z\_ROVHD.jpg

### Sample

Sample ID	
Date (UTC)	
Time (UTC)	
Depth (m)	
Temperature ( ° C)	
Field ID(s)	
Comments	A third biology sample was not collected on this dive.

Please direct inquiries to:

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