HAWAI'I UNDERSEA RESEARCH LABORATORY
QUICK LOOK REPORT
DIVE: PV-639

MISSION STATUS

Location: Volcano 19, South Tonga (Tofua) Arc

Latitude: ***Begin*** 24° 48.52'S **Longitude:** ***Begin*** 177° 00.224'W

Mission Date: June 17, 2005 **Duration:** 6 hours 30 min (Bottom Time)

Maximum Depth (m): 585 m

Project Title: SITKAP
(Submersible Investigations of the Tonga-Kermadec arc using PISCES)

Principal Investigator: Prof. Peter Stoffers, Kiel University
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Observer 1: Roger Hekinian **Observer 2:** None
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Pilot 1: Terry Kerby **Pilot 2:** Max Cremer

Scientific Data Acquired: Video, hand-held still photos, rock samples, bio sample, scoop samples, geological map

Objectives:
Objectives: Explore the main volcanic cone located on the eastern side of the major caldera forming volcano # 19. Since the shallowest part of the volcanic cone is at about 380 meters depth a contour depth at about 500-550 m was chosen to circumnavigate the southern portion of the volcanic cone (WP1 to WP3). Field observation of on the morphology and structure of the three summit or highs forming the main volcanic cone and the small pit craters (WP3 and WP4) (<300 meters in diameters) were explored. Search and sample volcanic rocks associated with the various structures and the hydrothermal fields. In addition, it was intended to delineate the extent of hydrothemal activity of the main volcanic cone by sampling and temperature probing at various locations. Another goal was to define the geological setting on which the hydrothermal fields Fe-Si oxyhydroxide and barite active chimneys found during dive PV638 were formed (WP 7 and WP8).
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Observations, findings, etc: (Also see Appended Dive Log)

Summary: The dive was launched in a very good weather conditions, allowing a bottom time of about 6 hours. A nearly half-circumnavigation around the main volcanic cone located to the east of volcano 19 caldera was conducted at a contour depth of about 500-550 m. This survey includes mainly the southern portion of the volcanic cone where extend the Fe-Si oxyhydroxide forming flat lying crust, small mounds and small ridges occur. The area covered by Fe-Si oxyhydroxide shows sporadic and diffuse low temperature ($<30^0$C) venting associated with bacterial mats. Along the south-eastern side of the cone two small pit craters of 40 and 70 meters depths were explored. They are moderately sedimented and the volcanics are covered by Fe-Si oxyhydroxide crust. A few dyke swarms and talus of massive lava exposed at the rims of the pit craters. The northern rim of the most easterly located pit-crater (WP3) shows diffuse venting at 537 m depths with abundant biology (dead clams and alive starfish).The three highs forming the summit of the main volcanic cones were explored. The northeastern high consists of a plateau covered by Fe-oxyhydroxide crust colonized by small corals and no traces of hydrothermal activity. The Fe-oxyhydroxide crust lying on top of scoria looking "aa" type of lava flows are exposed along an E-W trending fault scarps. The central high with barite hydrothermal chimney formed on top of massive lava flows along a SW-NE (N020 ^{0}) oriented ridge probably associated with a fault is also formed with massive lava flows. The south-western high where active venting and barite was found during dive PV638 consists also of Fe-oxyhydroxide crust on top of massive basaltic flows exposed along E-W fault scarps. A mall low temperature (26.7 ^{0} C) hydrothermal field was found at 426 meters on the most south-westerly tip of the volcanic high. This field occurs in a "caved-in" lobate lava flow type of setting. Several biological specimens were collected from the hydrothermal field.

Species List:

MISSION EVALUATION:

A. Limitations, failures, or operational problems noted:

None.

B. Recommendations for corrective action or improvement:

Visibility on the observer site limited.

C. In your opinion, did the mission essentially achieve its purpose?

Yes, for all objectives.

D. Compare actual work accomplished with the work that was expected to be accomplished.

E. List specimens or samples collected on the mission. (See Sample List Below):

Sample Number	Time (L)	Latitude Min/decM 24degS	Longitude Min/decM 177degW	Depth(m)	Comments Volcano 19:
PV-639 scoops 1, 2	09:33	48.555	0.426	557	Gravel and sand size debris of volc
PV-639-R1, R2	10:37	48.563	0.053	481	Massive layered flow with fractured
PV-639-R3	10:58	48.563	0.053	478	In situ, flat fragment from massive fl
PV-639-R4	11:20	48.481	176º59.998	528	Small fragment with reddish-yellow
PV-639-R5	14:43			540	Hydrothermal material
PV-639-R6	11:52	48.431	59.937	514	In situ, 35 cm in diameter dyke com
PV-639-R7	12:20	48.414	59.965	563	Ropy lava fragment partially buried
PV-639-R8	12:33	48.461	59.897	485	Fe-Si oxyhydroxide crust
PV-639-R9	13:19	48.169	0.1	405	Tubular and vesicular lava flow
PV-639-R10	13:34	48.261	0.09	438	Altered light-gray rock
PV-639-R11	13:34	48.261	0.09	438	In situ rounded Fe-Mn coated whitis
PV-639-R12	13:34	48.261	0.09	438	Large square rock sample.
PV-639-R13	14:00	48.24	0.1	384	Radial jointing, volcanic rock
PV-639-R14	14:15	48.24	0.1	384	Altered basaltic rock with Fe-oxide c
PV-639-R15	14:36	48.25	0.108	396	Altered basaltic rock.
PV-639-R16	14:36	48.25	0.108	396	Tubular and vesicular lava flow
PV-639-R17	15:10			480	Fragment (15 cm in diameter) of ma
PV-639-scoop 3	14:36	48.378	0.147	412	Gravel and sand size hydrothermal
PV-639-R18, R19, 20	15:46	48.402	0.165	426	Altered lobate rock coated with hydr

PV-639 Biology 6/17/2005 Volcano 19

Samples collected:

PV-639-A1a, b	Brachyuran crabs - from biobox				
PV-639-A2	Polynoidae (2) - from biobox				
PV-639-A3	Mussels (8) - from rocks in biobox				
PV-639-A4	Limpets (25) - from rocks in biobox				
PV-639-A5	Asteroidea	11:43,	540m		
PV-639-A6	Ophiuroidea - found in gorgonian				
PV-639-A7	Echinoidea 13:06, 409m				
PV-639-A8	Polychaete				
PV-639-A9	Polychaete				
PV-639-A10	Barnacle				
PV-639-A11	Hydrozoa				
PV-639-A12	Gorgonacea	13:13	400m	24	48.1697, 177 00.0101
PV-639-A13	Vent Worms	15:46	426m	24	48.4027, 177 00.1653

PV-639-A14 Brachyuran - several, found on vent worms
PV-639-A15 Galatheidae (2) - found on rocks
PV-639-A16 Worms (2) - found on rocks

Observed in video:

Midwater:
Munnopsidae
Salpida
Siphonophora
Mysida
Chaetognatha
Euphausiid
Ctenophora?
Trachymedusae

Benthic:
Elasmobranchii (mostly small, numerous)
Ophiuroidea
Hermit crab (large, 10:23)
Caryophiliidae (Lophelia like, abundant)
Solaster? (10:30)
Gorgonacea (small, white)
Anthomastus? (white, 10:33)
Caridea
Galatheidae (long armed, red)
Clams (numerous, unusual, roundish, all dead 11:33)
Mussels (elongate, all dead, 11:33)
Chaunax? (red)
Asteriidae (like sample asteroid - dense)
Pleuronectiformes
Gorgonacea (dense, smaller at first then larger, like sample)
Porifera?
Zooanthid anemones? (very dense on dikes, yellow)
Bythograeidae (at vents where worms were collected)