

Poseidon-Berichte

Paphsanias Volcano

Cruise POS512

25.04.2017 – 06.05.2017

Heraklion (Griechenland) – Heraklion (Griechenland)

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2017

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1 Summary

Cruise POS512 was scheduled for ten working days from 25.4. to 6.5.2017 in order to (1) produce a bathymetric map of the Epidavros Basin near the peninsula of Methana, (2) survey the volcanic structures of the Paphsanias Volcanic Field with the ROV PHOCA, and (3) sample the volcanic rocks. The Paphsanias Volcanic Field was found in 1987 but only one rock sample had been recovered and the size, age and composition of the lavas were unknown. Historic reports suggested an eruption on Methana and potentially off the coast some 2000 years ago. The bathymetric survey showed that six volcanic structures form the volcanic field ranging from simple lava flows on the seafloor, small cone-like structures to relatively complex crater-like structures with small volcanic domes. The largest volcanoes are about 200 m high and have diameters of about 2 km. The northern two complex Volcanoes 1 and 2 are relatively young and consist of steep lava flows and dome-like structures with little sediment. No indication of very young volcanism and hydrothermal activity was found. In contrast, the four southern structures are mostly sediment-covered and outcrops of volcanic rocks are rare and often covered by thick carbonate and MnOOH crusts. These four edifices are older than the northern two. Lava samples range from olivine-bearing basalts to plagioclase-amphibole-biotite-phyric andesites and dacites. All lavas appear to be fresh but few show signs of submarine extrusion and quenching. Volcaniclastic material was rarely observed and sampled indicating that explosive volcanic activity did not occur. During cruise POS512 13 ROV dives recovered 163 samples including 131 fresh lavas from four different volcanoes of the Paphsanias Volcanic Field and 427 nm of bathymetric survey was carried out.

2 Participants

Name	Discipline	Institution
Haase, Karsten	Petrology/geochemistry	GZN, FAU
Beier, Christoph	Petrology/geochemistry	GZN, FAU
Wölki, Dominic	Petrology/geochemistry	GZN, FAU
Storch, Bettina	Petrology/geochemistry	GZN, FAU
Lampridou, Danai	Bathymetry	NKUA
Karagiannakis, Eustratios	Archeological observer	EUA
Pieper, Martin	ROV PHOCA	GEOMAR
Bodendorfer, Matthias	ROV PHOCA	GEOMAR
Cuno, Patrick	ROV PHOCA	GEOMAR
Huusmann, Hannes	ROV PHOCA	GEOMAR
Matthiessen, Torge	ROV PHOCA	GEOMAR

GZN, FAU GeoZentrum Nordbayern, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

NKUA National and Kapodistrian University of Athens, Athens, Greece

EUA Ephorate of Underwater Antiquities, Athens, Greece

GEOMAR GEOMAR Helmholtz-Zentrum für Ozeanforschung, Kiel, Germany

3 Research Program

From the published maps of Nomikou et al (2013) we assumed that Paphsanias Volcano is one large edifice and the idea was to sample the entire volcanic structure in order to understand the evolution of the volcano and potential changes in lava composition and eruption parameters. However, one surprising result of this cruise is that there are six different volcanic lava flows and more complex structures on the seafloor. The petrologic and geochemical data will be compared to the lavas from Methana and Aegina that we collected in November 2015 and that have been the basis for two Master theses (Schönhofen, 2016; Wölki, 2016).

Within this project we want to test the following hypotheses:

- The Paphsanias Volcanic Field represents an early stage of submarine volcanism and may evolve to larger structures similar to those on Methana and thus it offers insights into these early volcanic processes with seafloor eruptions. We assumed that the volcanism is mainly formed from effusive lavas rather than from volcanoclastic rocks and that we can define the relative age of the lavas by stratigraphic sampling. The outer flanks of the volcano probably consist of earlier eruption products and potentially some late flank eruptions. Based on the suggested ten ROV dives we can map and define the evolution of the volcanism.
- The primitive magmas of the Methana and Aegina volcanic systems are basaltic and the andesites and more evolved melts form by fractional crystallization, assimilation and/or magma mixing. The submarine lavas of Paphsanias volcano will probably contain more glass in the matrix and possibly as rims that will allow us to constrain the composition of the liquids rather than using whole rock data. These glass compositions can be compared to melt inclusions and determine whether the inclusions are biased.
- Volcanic glass can possibly be separated from mineral phases and used to determine to what extent the mixing of liquids with crystals from previous magma batches in the crust leads to changes in incompatible element and radiogenic Sr, Nd, and Pb isotope compositions. We expect that the minerals contain a stronger crustal component whereas mafic glass should show more mantle wedge-like compositions.
- We studied olivine xenocrysts from Methana lavas with Fo90 that have $\delta^{18}\text{O}$ of 6 to 6.5 indicating reaction with sediments. Provided we find glass that can be separated as well as similar olivine in Paphsanias lavas we can compare whether the magmas formed in the mantle from this hybridized peridotite.

-
- Evidence for mixing of silicic and mafic magmas is observed in all lava units at Methana and Aegina but similar to the mafic lavas, there is a large variation in different silicic lavas. Thus, the determination of glass compositions from submarine Paphsanias lavas will help to understand mixing processes and define mixing of two melts and mixing of crystals into liquids during replenishment.
 - The silicic lavas show stronger evidence of crustal assimilation and the determination of different glass compositions yields insights into the variation of assimilation in actual liquids. The comparison of glass to mineral compositions will allow a quantification of assimilation processes including the reaction of liquids with older cumulates.
 - The suspected glassy Paphsanias lavas can be used to determine the concentrations of water and CO₂ as well as other volatile elements like Cl, F and S. These important elements yield insights into the magma sources, degassing processes, and assimilation of crustal rocks. We thus expect significant variation in these elements with variation of K contents in the mafic and silicic melts that can be determined by electron microprobe in the glass inclusions but also in the amphibole and apatite crystals.
 - The silicic magmas may form by extreme fractional crystallization or by partial melting of crustal rocks or mafic cumulate material. We suggest studying the melt inclusions as well as the minerals within the silicic lavas in order to define the origin of these melts. The major and trace element composition of the glasses and mineral phases will allow to determine their role in crystal fractionation, melting and mixing processes.
 - The O isotope composition of different phases from the silicic lavas will also yield important insights into the source of these melts because crustal rocks have higher $\delta^{18}\text{O}$ than mantle melts and thus we expect a wide range of O isotope compositions.

4 Narrative of the Cruise

(Haase, K.M.)

RV Poseidon left the port of Heraklion on Crete on April 25th at 13:00 slightly later than planned because the ROV PHOCA needed technical maintenance in port. The vessel steamed north in fine weather and calm seas and arrived at 8:00 on April 26th in the working area of the submarine Paphsanias Volcanic Field northwest of Methana Peninsula. Due to lack of a bathymetric map the volcanic field was swath-mapped with 3 to 4 knots and a map was prepared, especially for the ROV diving. The map showed the existence of six volcanic structures with heights of up to 200 m above the surrounding seafloor. On April 27th we started an ROV dive on the SE flank of Volcano 1 towards the top of the structure. This dive was very successful and yielded 21 rock

samples. Another dive on the SW flank of Volcano 1 started at 13:00 and brought up another 11 rock samples. This was followed by more mapping of the Epidavros Basin during the night. The next day was spent diving with the ROV on the S and N flank of Volcano 2 recovering 15 and 6 lava samples, respectively. During the night of April 28th to 29th we largely finished bathymetric mapping of the Epidavros Basin. On April 29th RV Poseidon steamed to the small port of Pachi on the northern coast of the Saronic Gulf in order to pick up spare parts for the ROV and returned to the working area at about noon. A dive from the base of the northern flank of Volcano 3 to the top showed that this is an old lava flow heavily covered by sediments and by biogenic carbonate in the shallower regions. Four volcanic rock samples and three of biogenic carbonate were recovered during this dive. The night from April 29th to 30th was spent mapping the northern parts of the Epidavros Basin which was followed by a dive from Volcano 4 to the western flank of Volcano 3. Both structures are sediment-covered and we were able to recover only three lava samples and several carbonate crusts. The afternoon dive was at Volcano 5 and of the nine samples taken, two may contain volcanoclastic material with the rest being carbonates. Mapping in the night to May 1st was started in the basin east of Methana where two seamounts of possible volcanic origin exist. In the morning of May 1st we determined the sound profile to calibrate the multibeam system by a CTD station. After that a long ROV dive was carried out on Volcano 1 that recovered another 20 fresh lava samples. In the night we resumed bathymetric mapping of the basin east of Methana. The next ROV dive was on the last volcanic structure in the SW of the Paphsanias Volcanic Field and brought up 11 samples, three of which are fresh volcanic breccias and bombs. After that the steep cliff at the SW end off Methana was studied by ROV and we observed that the cliff is formed by large massive rock surfaces with some sediment-covered gullies. The exposures are old and covered by thick carbonate and MnOOH crusts so that no rock samples were obtained. From the evening of May 2nd to noon of May 3rd RV Poseidon finished mapping of the basin east of Methana and the ROV had a break for technical maintenance. In the afternoon we visited Volcano 1 again and took another 15 lava samples which was followed by mapping of gaps in the Epidavros Basin. The final two dives were done on May 4th on Volcano 2 and Volcano 6 and yielded 16 and 4 additional lava samples, respectively. The last night of the working program was in the NW part of the Epidavros Basin before RV Poseidon started to head back to Heraklion in the morning of May 5th. The ship arrived at the port of Heraklion in the morning of May 6th after a very successful cruise.

5 Preliminary Results

5.1 Underway Hydroacoustics

(Lampridou, D., Haase, K.)

Bathymetric measurements have been carried out on-board R/V Poseidon with the hull mounted ELAC Nautik's SeaBeam 3050 multibeam. The multibeam installed is a 50 kHz multibeam with a beam width of $1.5^\circ \times 2^\circ$ and a maximum swath width of 140° . The system provides fully motion stabilized multibeam soundings along with HRP data. The maximum water depth of the system is about 3000 meters, depending on environmental conditions. The system provides fully motion stabilized multibeam soundings along with HRP data. The maximum water depth of the system is about 3000 meters, depending on environmental conditions.

Swath mapping has been conducted on daily basis during the nights, around Methana Peninsula. Data acquisition has been done with the software Hydrostar in combination with the survey and processing software package HYPACK 2016a. The multibeam settings (beam angle, pingmode, source level, pulse length and desired ping rate) were set to automatic mode and the beam spacing mode was set to equi-distant. For bottom search first the gates were set manually and switched to automatic mode after the bottom signal was found. The data were stored using HYPACK into half hour '.HSX' files and also via Hydrostar into the native ELAC XSE-data format in order to avoid software crashes, especially during midnight when HYPACK produces bad-georeferenced beams. The acquired data were pre-processed with open source package MB-SYSTEM. Further processing will take place at the University of Athens and the data will be gridded with a cell size of 5m.

Although the area had been mapped before we decided to prepare a detailed map specifically for the diving area but also for the previously unmapped regions of the Epidavros Basin and other parts of the Saronic Gulf (Fig. 1). The map of the diving area showed very different structures to the previous map published by Nomikou et al. (2013). Rather than one large edifice we found six different smaller structures (Fig. 1) ranging from steep massive lava flows (Volcano 3) to more complex crater-like structures with lava domes (Volcano 1). Altogether 427 nm of bathymetric survey were conducted which yielded a high-resolution map of the seafloor of the Epidavros Basin. The map also reveals two linear steep cliffs in the north and south of the volcanoes indicating that the submarine volcanism occurs in a young extensional basin west of Methana. An irregular seamount east of Methana may represent another volcanic structure but no samples were taken in this region.

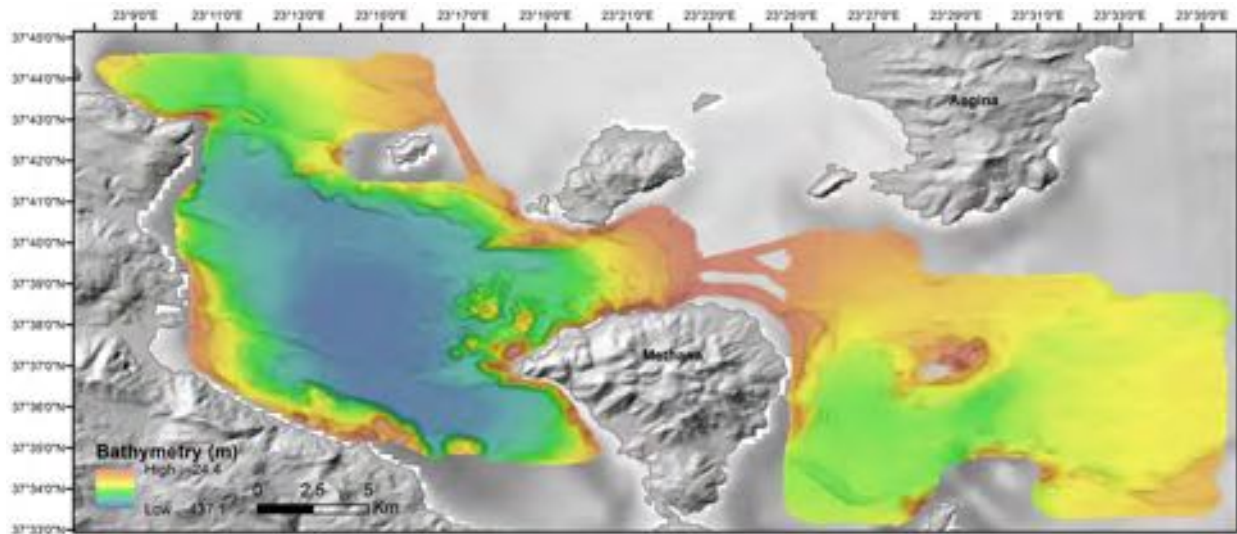


Figure 1. Bathymetric map acquired during the POS512 cruise showing the six young volcanic structures west of Methana as well as the linear submarine cliffs in the north and south representing normal faults.

5.2 ROV deployments during POS512 in the Aegean Sea at Paphsanias Volcanic Field (Pieper, M., Bodendorfer, M., Cuno, P., Huusmann, H., and Matthiessen, T.)

5.2.1 Description of the ROV

ROV PHOCA (Fig. 2) is a 3000 m rated deep diving platform manufactured by SubAtlantic FET, Aberdeen, Scotland. It is based on commercially available ROVs, but customized to our demands, e.g. being truly mobile. ROV PHOCA has previously been operated from the medium sized German research vessels POSEIDON, SONNE and ALKOR. As an electric work class ROV of the type Comanche, this is build No. 21. During POS512, a midwater winch with a steel armoured fibre optic cable was used with a maximum length of 2700 m and a 19 mm diameter. The deck's setup during launch is shown in Figure 1.

The vehicle carries various cameras (Fig. 3): 1 HDTV Bullshark (which was recorded permanently), 2 colour zoom video cameras (OE14H366) mounted on pan and tilt units, 2 black and white video cameras (OE15H108) and a digital stills camera. Lighting for the video cameras is provided by 4 MultiSeaLite Matrix LEDs (250 W) and 4 dimmable 250 W Deep MultiHSeaLite halogen lights.



Figure 2. ROV PHOCA being launched from RV Poseidon in the Epidavros Basin during POS512

ROV PHOCA (Fig. 2) is based at GEOMAR, the Helmholtz Centre for Marine Sciences Kiel, Germany. Navigation was provided by two ORE Trackpoint USBLH Transponders (Sonadyne) communicating to a transducer deployed through the ship moonpool, with a CDL TOGS fiber optics Gyro and an RD Instruments 1200 Doppler Velocity Log. The vehicle also carried a FastCAT CTD SBE 49 manufactured by SeaHbird. Real time observational logs were kept using OFOS (Ocean Floor Observation System) by a scientist in the laboratory. For more details on the ROV system please visit <http://www.geomar.de/PHOCA>.

5.2.2 ROV tasks during POS512

During this cruise, the main objective was surveying the volcanic structures in order to determine their size and age and sample volcanic rocks for petrological and geochemical analysis. During cruise POS512, 13 scientific dives (Table 1) were completed. Maximum bottom time was 06:50 hours and accumulated to approx. 24 hours (total dive time approx. 30 hours). For a detailed description of the dives, please refer to chapter 5.3.

We would like to thank Captain Volland and his crew for cooperation and support.



Figure 3. Setup 1 used during the dive operations of POS512.

Photo: ROV-Team GEOMAR

Table 1: ROV station list during cruise POS512

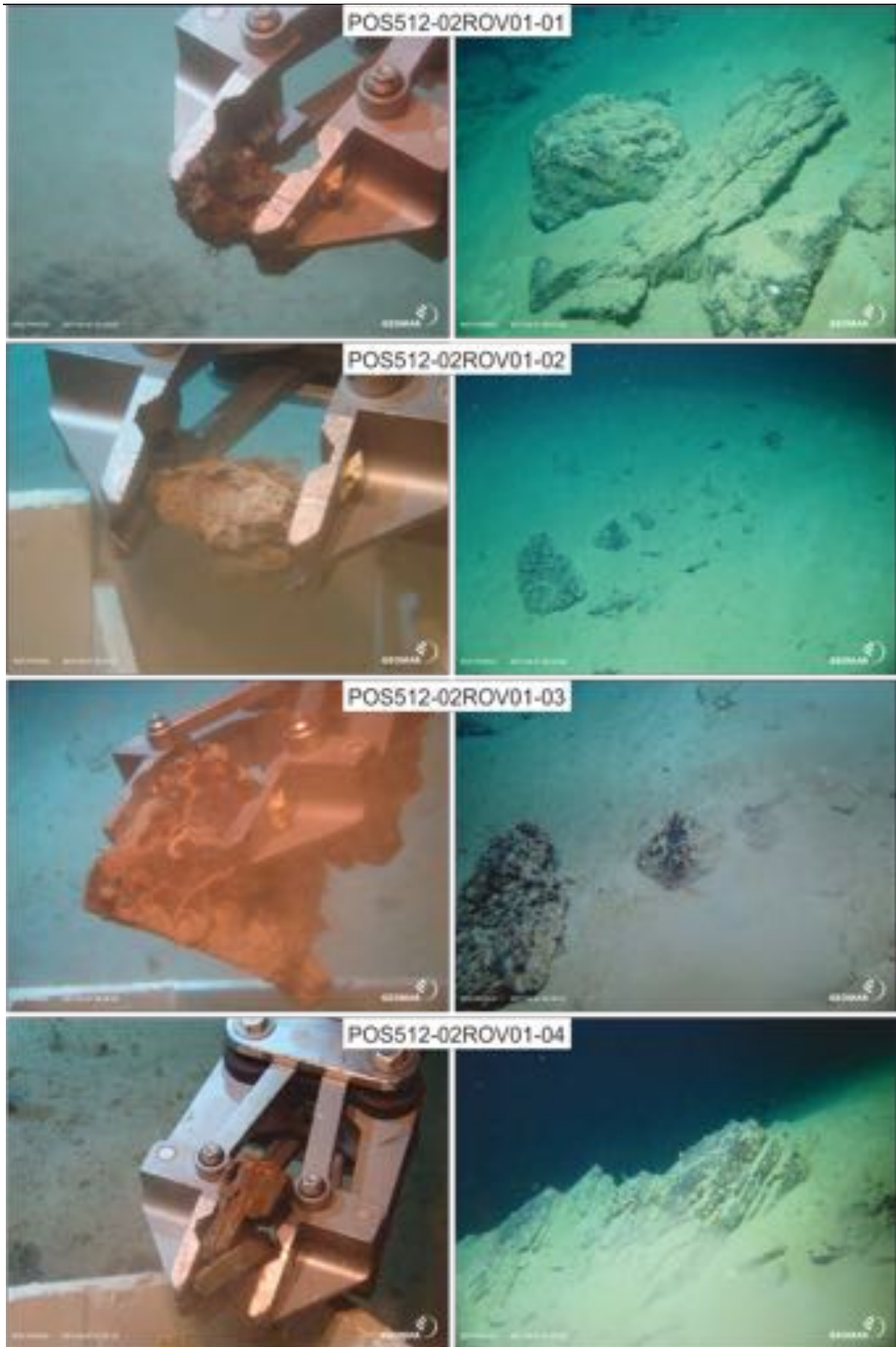
Station	Dive No.	Date (UTC)	Time Start (UTC)	At Bottom (UTC)	Off Bottom (UTC)	Time End (UTC)	Location	Depth (m)	Bottom Time	Task
02ROV01	98	27.04.2017	05:55	06:10	10:13	10:26	Volcano 1 SE	350	04:03	Survey and rock sampling
03ROV02	99	27.04.2017	11:15	11:33	14:14	14:27	Volcano 1 SW	350	02:41	Survey and rock sampling
05ROV03	100	28.04.2017	05:41	05:58	09:57	10:09	Volcano 2 S	250	03:59	Survey and rock sampling
06ROV04	101	28.04.2017	10:59	11:16	14:03	14:14	Volcano 2 N	280	02:47	Survey and rock sampling
08ROV05	102	29.04.2017	09:44	09:51	14:04	14:12	Volcano 3	270	04:13	Survey and rock sampling
10ROV06	103	30.04.2017	05:31	05:42	10:06	10:14	Volcanoes 4 & 3	270	04:24	Survey and rock sampling
11ROV07	104	30.04.2017	11:23	11:39	14:14	14:25	Volcano 5	370	02:25	Survey and rock sampling
14ROV08	105	01.05.2017	06:25	06:56	13:46	13:58	Volcano 1 SW	390	06:50	Survey and rock sampling
16ROV09	106	02.05.2017	05:28	05:46	09:34	09:46	Volcano 6 SW	360	03:48	Survey and rock sampling
17ROV10	107	02.05.2017	10:50	11:05	14:18	14:29	Steep cliff Methana	310	03:13	Survey and rock sampling
19ROV11	108	03.05.2017	10:42	10:56	14:11	14:22	Volcano 1 NW	300	03:15	Survey and rock sampling
21ROV12	109	04.05.2017	05:25	05:38	10:12	10:25	Volcano 2 SE	240	04:34	Survey and rock sampling
22ROV13	110	04.05.2017	11:57	12:11	13:58	14:15	Volcano 6 NW	300	01:47	Survey and rock sampling
Total: 13 scientific dives									23:59	

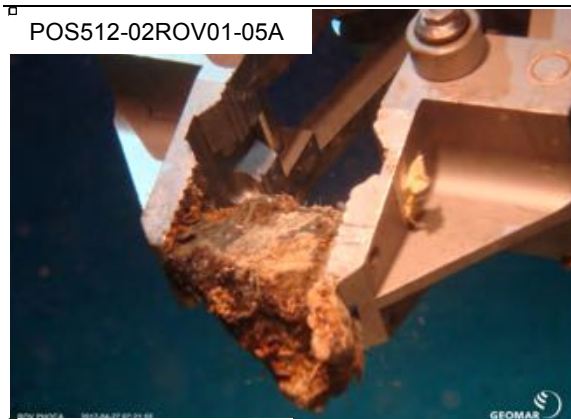
5.3 *Dive descriptions*

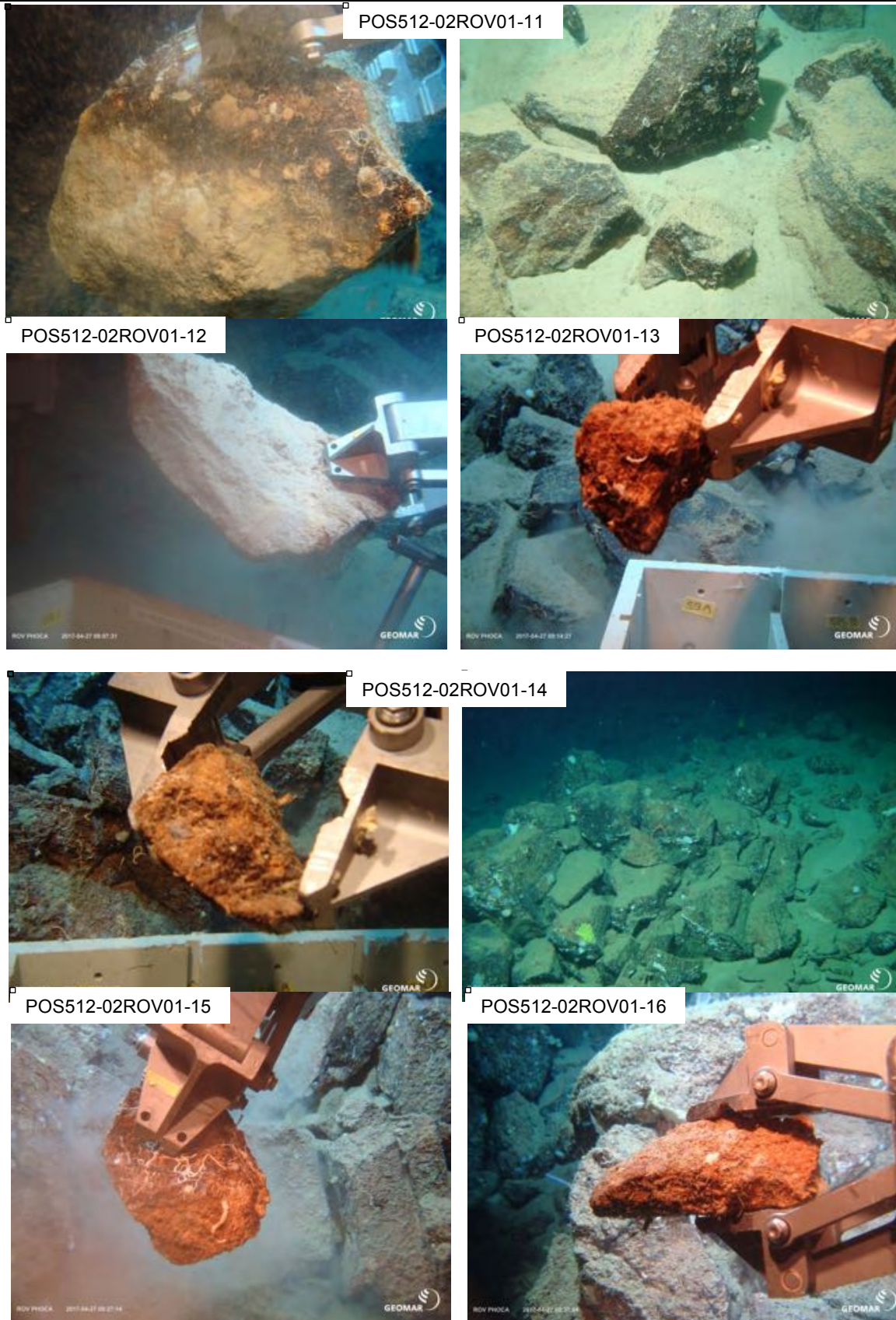
5.3.1 Dive 02ROV01 on the SE flank of Volcano 1

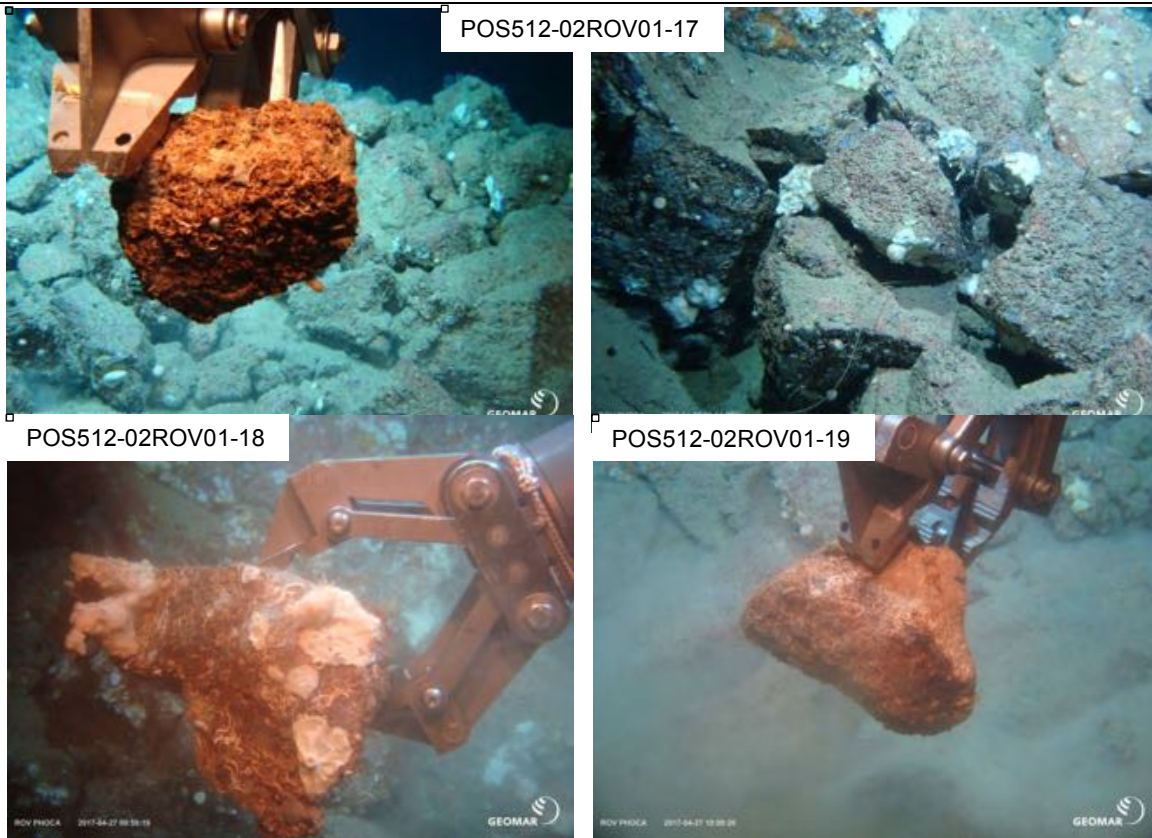
The main objective of this dive was to investigate and sample the SE Flank of the Paphsanias Volcano 1. The first impression of the volcano was that it consists of a possible older crater structure with a younger volcanic phase building up a dome-like structure, in the centre.

The dive started in the SSE at 316 m depth in a relatively flat sedimentary area, and went further northwards up to the eastern cone. Approaching the slope, first lava debris fields showed up. Two types of lava fragments have been sampled. The first appeared sub-rounded to angular and fresh (sample 01-03), the other boulders showed a planar layered structure of consolidated volcanoclastic sediments (sample 04). Moving up the slope and approaching the top of the smaller eastern cone, the amount and size of the andesites increased (sample 05-11). Due to possible fishing lines in the water column, the dive continued from the eastern cone in NW direction to the top of the structure. Passing the depression between the smaller south-eastern cone structure and the north-western dome-like structure, the amount of the debris decreased and changed to a sediment-dominated area. One sample (sample 12) has been taken from larger lava fragments. The last part of the dive moved up the steep slope, where numerous lava flows showed up (200-180 m depth) forming massive outcrops. Some larger, angular andesitic rocks were sampled (sample 13-19).





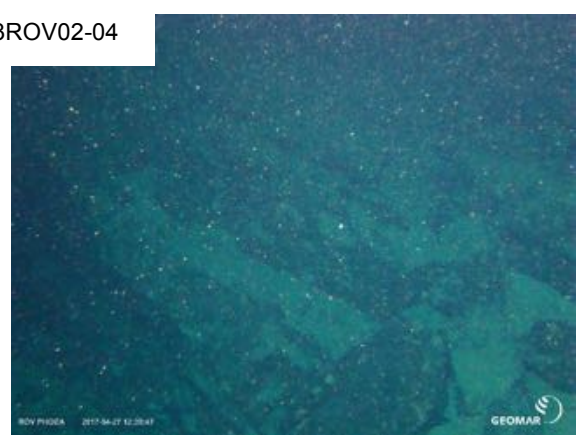
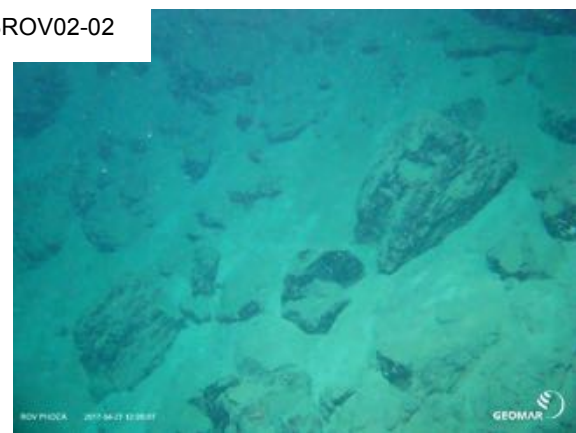


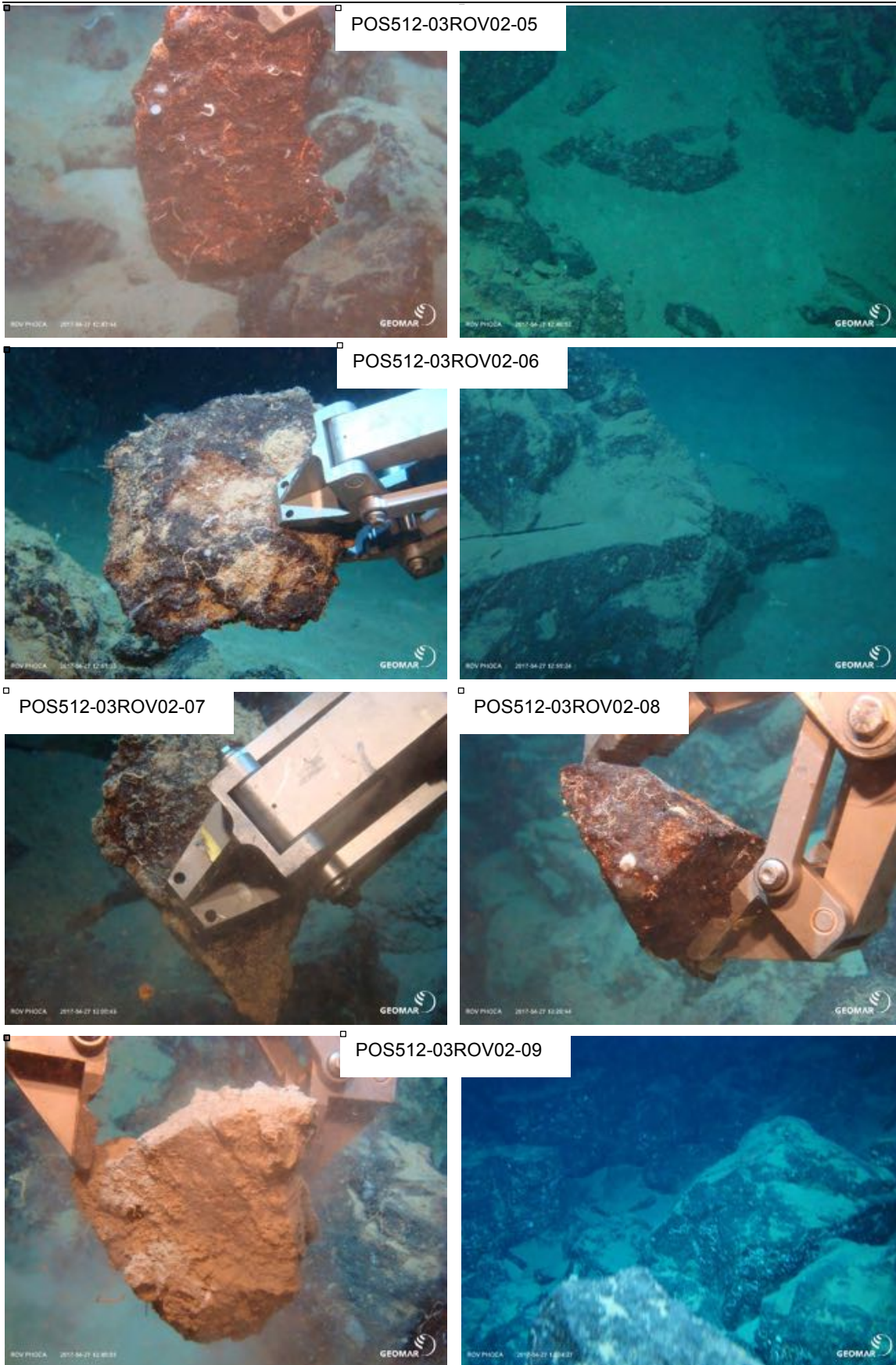


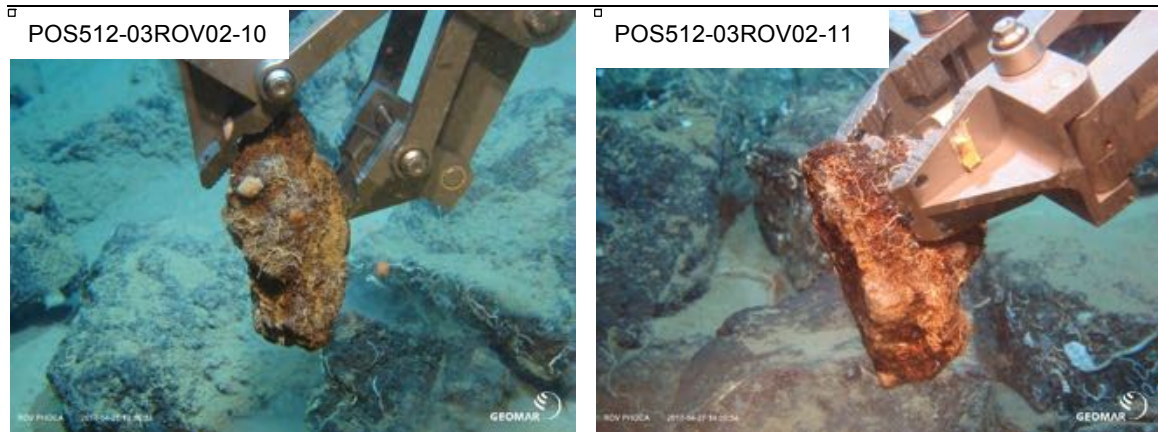
5.3.2 Dive 03ROV02 on the SW flank of Volcano 1

The objective of the dive was the SW Flank of the Paphsanias Volcano 1. Starting at 335 m depth in a flat sedimentary basin moving northward up to the top of the eastern cone.

Larger boulders are lying in the fine sediment at the lower part of the slope. Two samples were taken (sample 01, 02). During ascending the morphology changed to massive lava flow outcrops (sample 03) in turns with lava debris fields in fine sediment. Some rocks seemed to have a dike-like structure. Angular rocks from talus pile were sampled (sample 04-06). Sample 07 belongs to an outcrop of lava flows followed by a more sediment-covered area with individual boulders (sample 8). Approaching the top several massive outcrops appeared. A possible flank of a ridge or dome with larger angular blocks was sampled. Some rocks occur in a possible rounded flow front lying in fine sediment (sample 9). The large and angular samples 10 and 11 belong to a field of blocky lava at the top of the smaller cone structure at the western flank.



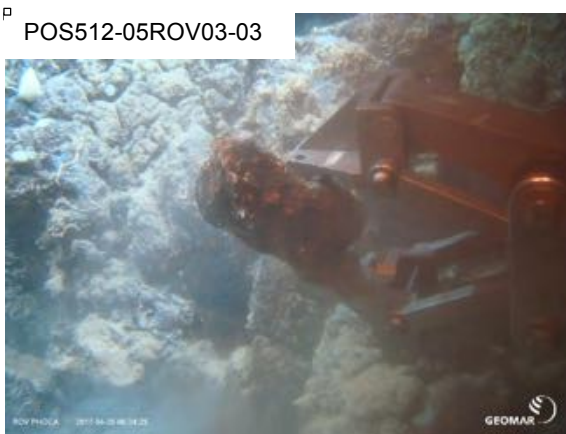
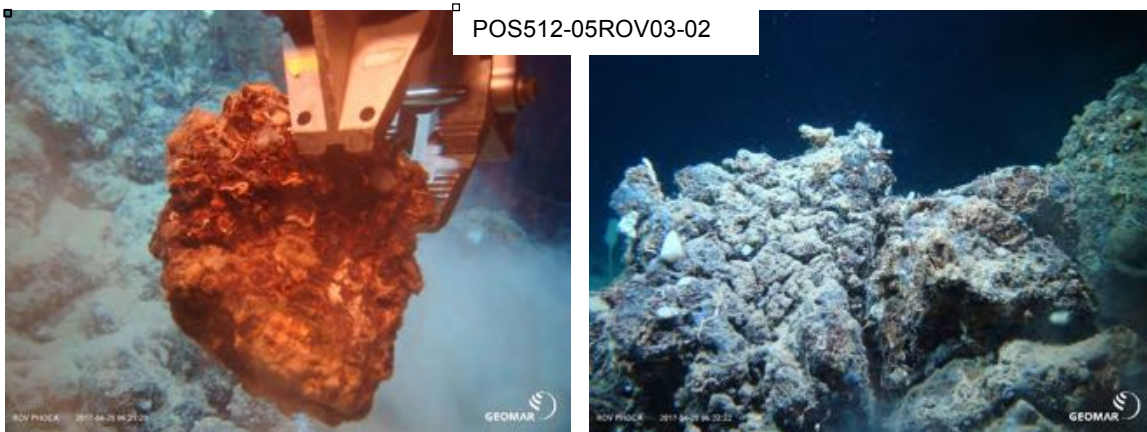
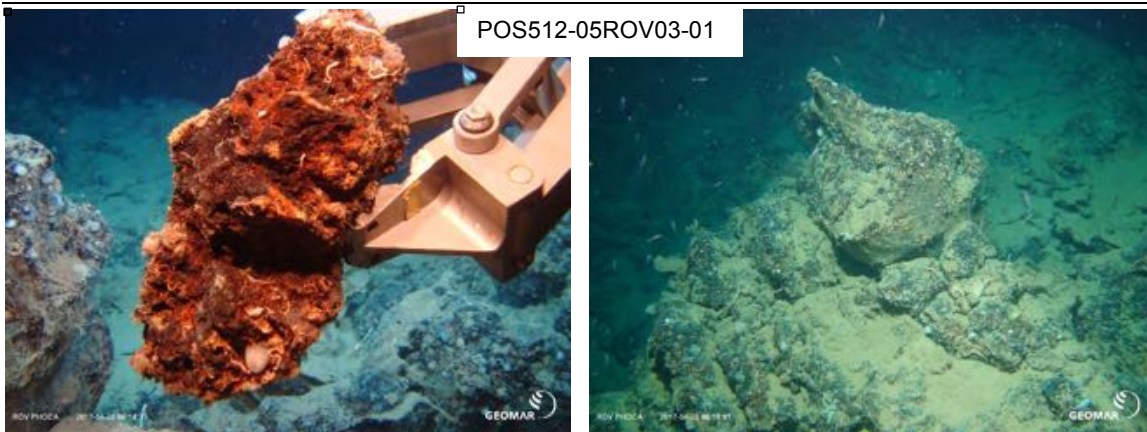




5.3.3 Dive 05ROV03 on the S flank of Volcano 2

The objective of the dive was the sampling of the southern flank of the Paphsanias volcano 2. Starting at 251 m depth in a sedimentary basin.

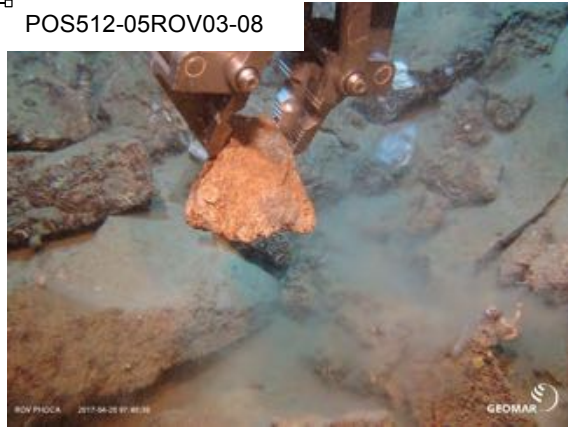
Start of diving was in the SW in an area with sedimentary ripples followed by lava flows with angular rocks with flow texture (sample 01, 02). Passing a long distance over sediment in turns with corals north-eastwards. At 219 m depth on top of a small ridge sample 03 was taken and the dive continued to a small plateau in the south (samples 03-06) and over the SW ridge up to the top. From the lower part of the ridge up to 175 m depth lava flows (sample 07-08) in turn with debris fields appeared. Half the way up the ridge smaller lava domes and massive lava flows and boulders with flow textures are dominant (sample 09-10). Passing another sedimentary plain followed by possible pillow structures and debris fields, the samples 11-13 were taken. Up to the top numerous outcrops of massive lava flows (samples 14, 15) appeared in turns with short sedimentary parts. In general this south-western flank had more evolved biology (fishes, corals) and the SW-trending ridge seemed to be a relatively young magmatic structure.



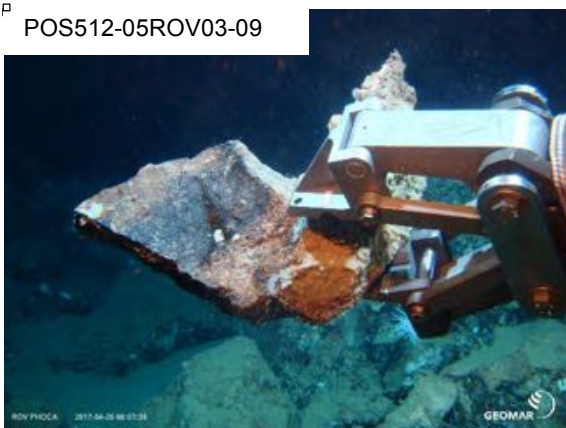
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POS512-05ROV03-08



POS512-05ROV03-09



POS512-05ROV03-10



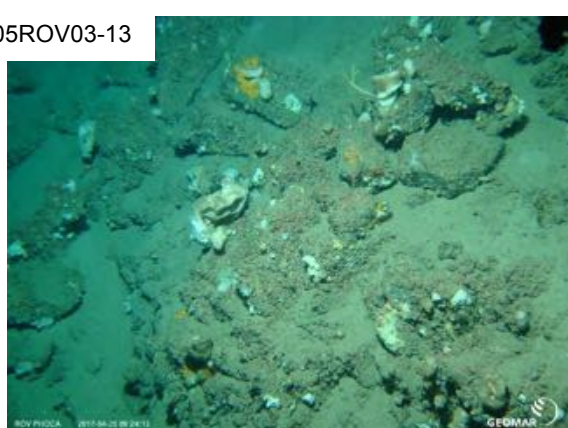
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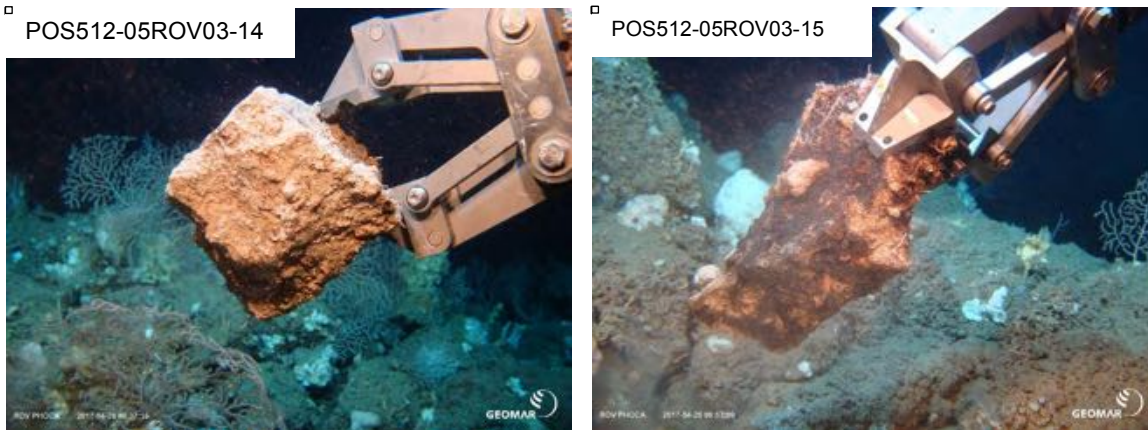


POS512-05ROV03-12



POS512-05ROV03-13





5.3.4 Dive 06ROV04 on the N flank of Volcano 2

The objective of the dive was to sample the smaller cone structure and the NW Flank of the dome-structure. Starting at 300 m depth in a sedimentary basin.

Diving a longer distance across a sedimented area with burrows and partly angular blocks of lava (sample 01). While approaching the top of the smaller cone loose lava fragments were sampled (sample 02A & B). Descending the cone structure numerous angular lava fragments are lying within the fine sediment (sample 03). The dive continued towards the SSW over a sedimentary valley between the two raised structures. At the bottom of the slope more talus was sampled (sample 04). With the steepening of the slope a massive lava flow front appeared (sample 05). Ascending the slope other lava flows in turn with debris fields and sediment appeared. The last sample (sample 06) belongs to a massive lava front followed by a sediment-covered slope with large boulders. In general, the first part on the small conic structure in the NW could probably be an older sedimented flow. The northern part of the higher dome-like structure appears younger.

POS512-06ROV04-01



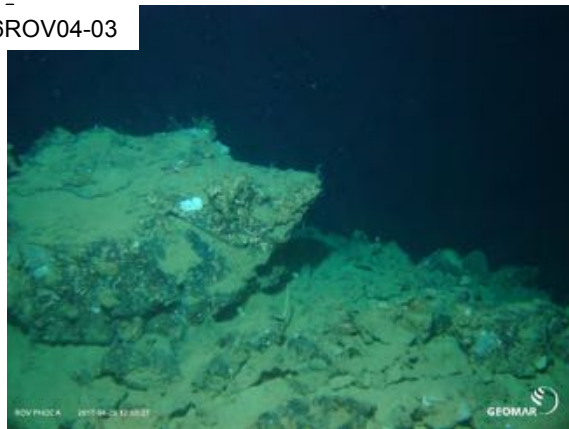
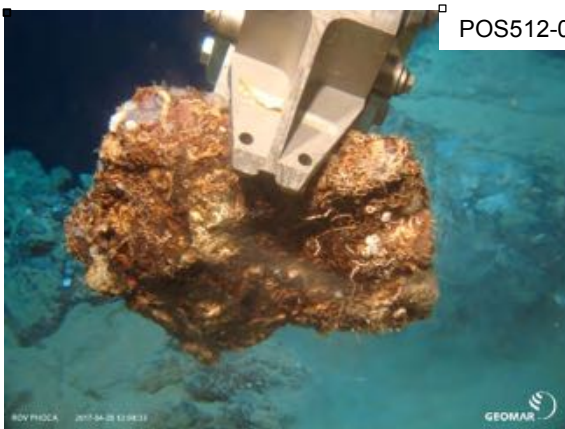
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POS512-06ROV04-02B

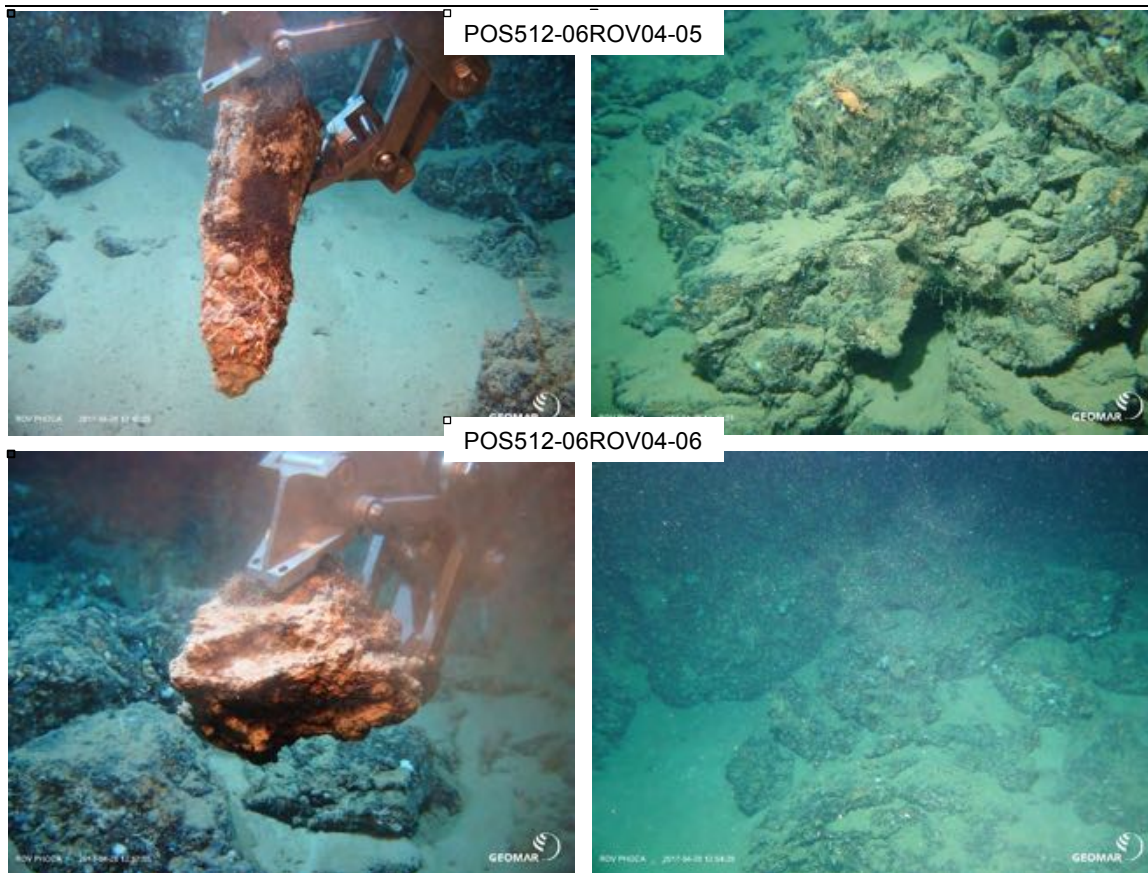


POS512-06ROV04-03



POS512-06ROV04-04

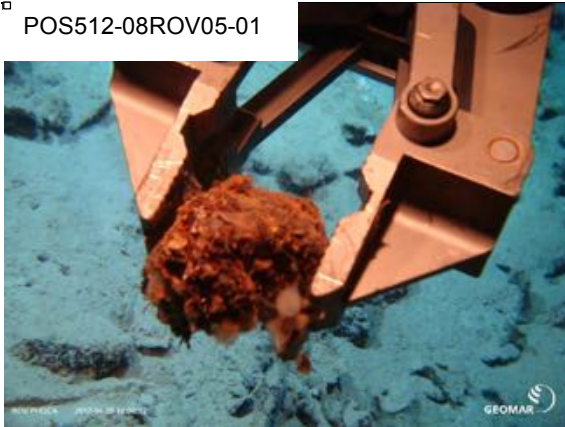




5.3.5 Dive 08ROV05 on the W flank of Volcano 3

The objective of the dive was the sampling of the northern ridge of the Paphsanias Volcano 3. Starting at 270 m depth at the northern edge in a sedimented area and diving, first, south-eastwards across a ridge to the top. The first samples from the lower part of the ridge seemed to be magmatic rocks from possible lava flows but covered with thick sediment and biology (sample 01-04B). Sample 03 appeared well-rounded and strongly oxidised, and probably is from the island. Moving south to south-westwards, approaching the top and the photic zone, the amount and diversity of the organisms increased and the pebbles and boulders, mostly carbonate rocks (sample 05-07), were covered by fauna. In general, the sampling was difficult because of very compact rocks, fishing nets and the biological cover.

□ POS512-08ROV05-01



□ POS512-08ROV05-02



□ POS512-08ROV05-03



□ POS512-08ROV05-04A



□ POS512-08ROV05-04B



□ POS512-08ROV05-05



□ POS512-08ROV05-06B



□ POS512-08ROV05-07



5.3.6 Dive 10ROV06 from Volcano 4 to SW of Volcano 3

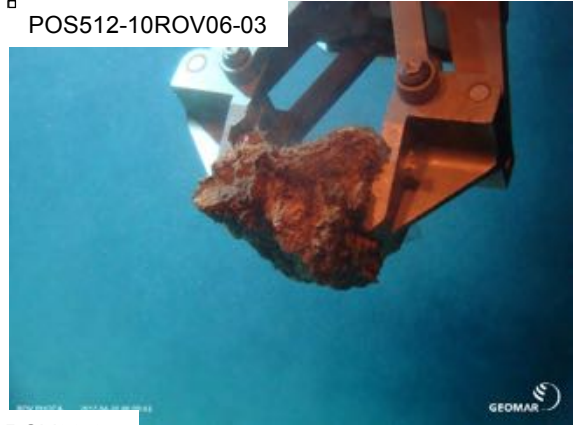
The objective of the dive was the sampling of the Paphsanias Volcano 4. Starting in the NW of the volcano diving towards the top and over the depression towards the western flank of Volcano 03.

Starting in a sedimentary basin moving on towards the top, a possible old lava flow was sampled (sample 01). All the way up to the top of Volcano 4 and continuing towards Volcano 3 the slope was mainly covered with sediments and biology, and only occasional boulders, which has been sampled (sample 02-04). Continuing the dive up towards the western flank of the Volcano 3 the amount of debris and talus fields increased. The rocks were covered with biology and sediment (sample 05, 06). Approaching the plateau the talus resembled possible lava flow outcrops but was covered by a thick carbonate coating (07A-08). All in all, the sampling was difficult because of the coating, numerous fishing lines and the solid rocks.

POS512-10ROV06-02



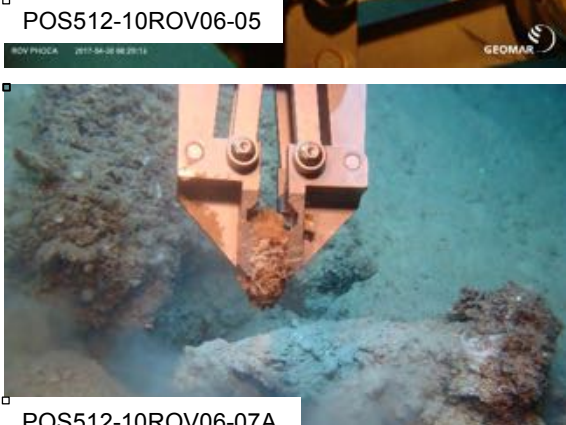
POS512-10ROV06-03



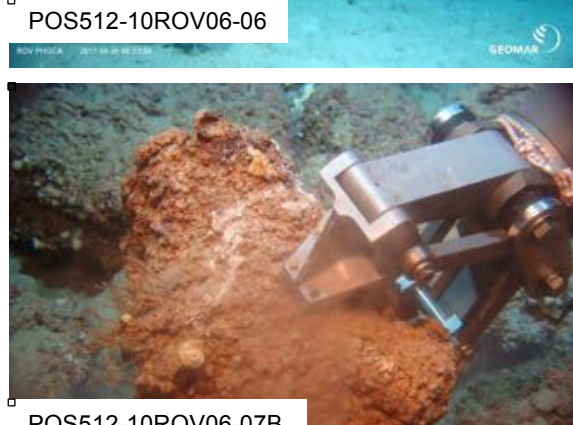
POS512-10ROV06-04



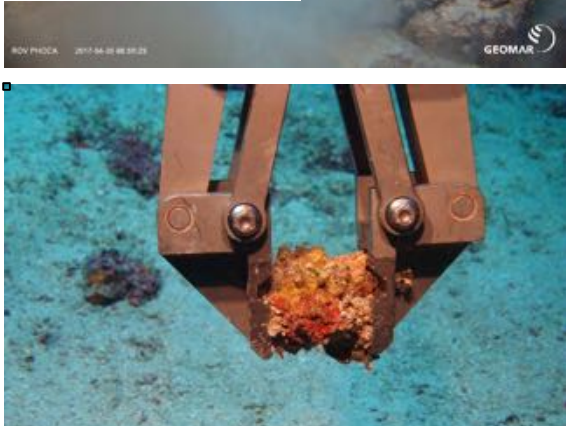
POS512-10ROV06-05



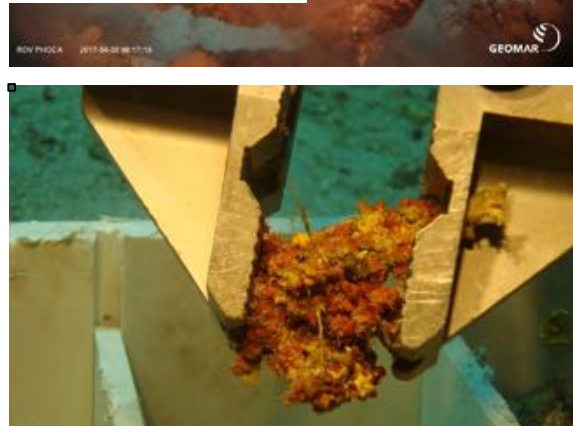
POS512-10ROV06-06



POS512-10ROV06-07A



POS512-10ROV06-07B

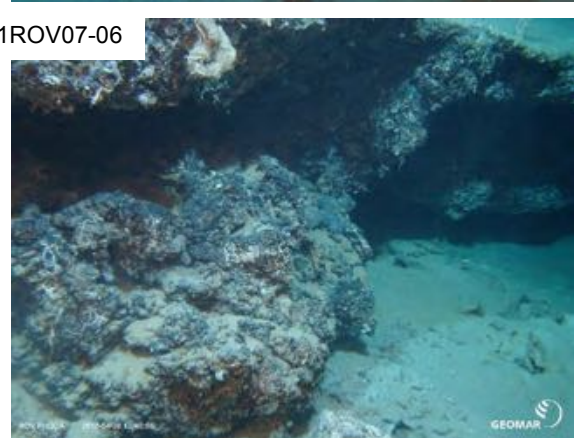
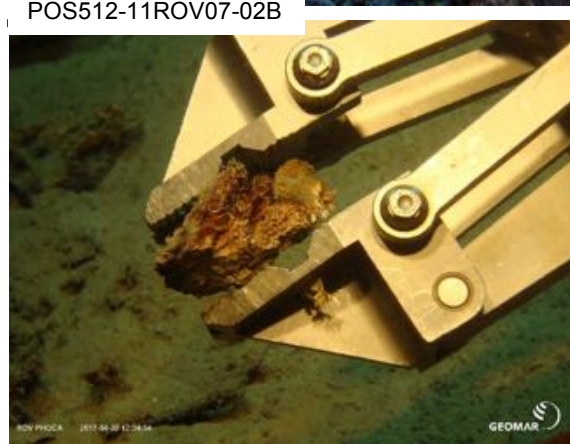
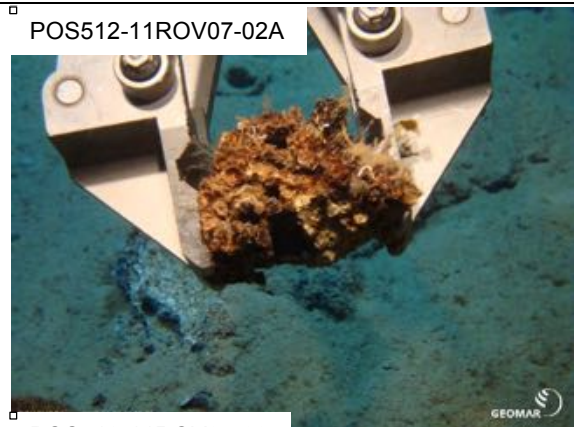
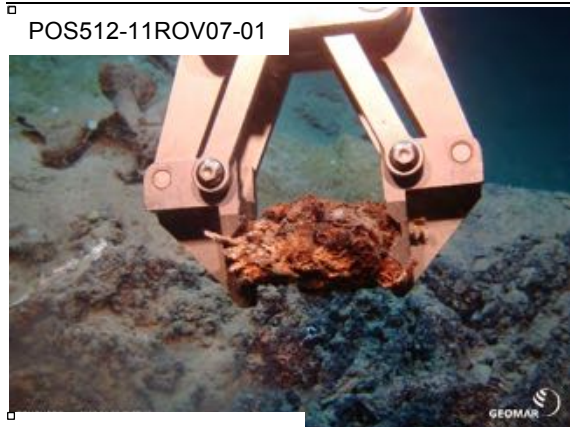




5.3.7 Dive 11ROV07 to the top of Volcano 5

The main objective of this dive was the survey and the sampling of the Paphsania Volcano 5. Starting at the bottom of the slope moving up the NW flank towards the top.

The first 100 m depth were mostly covered with sediment. Approaching the top the first rocks, possible lava fragments, appeared (sample 01-03) in turns with sediments and debris fields. Passing the top, a possible andesitic sheet flow was sampled (sample 04 & 05). Again, passing a sedimentary passage followed by possible lava flows that were sampled (sample 06 & 07).

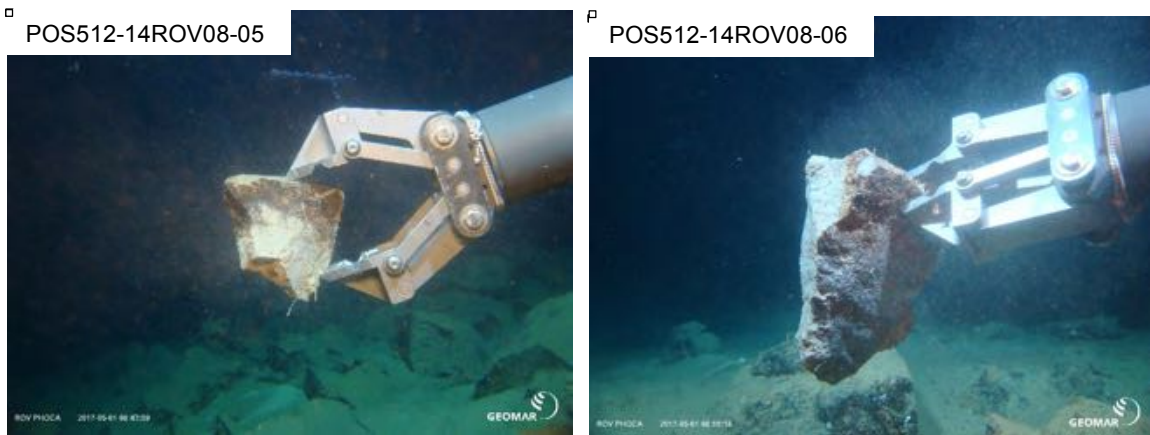
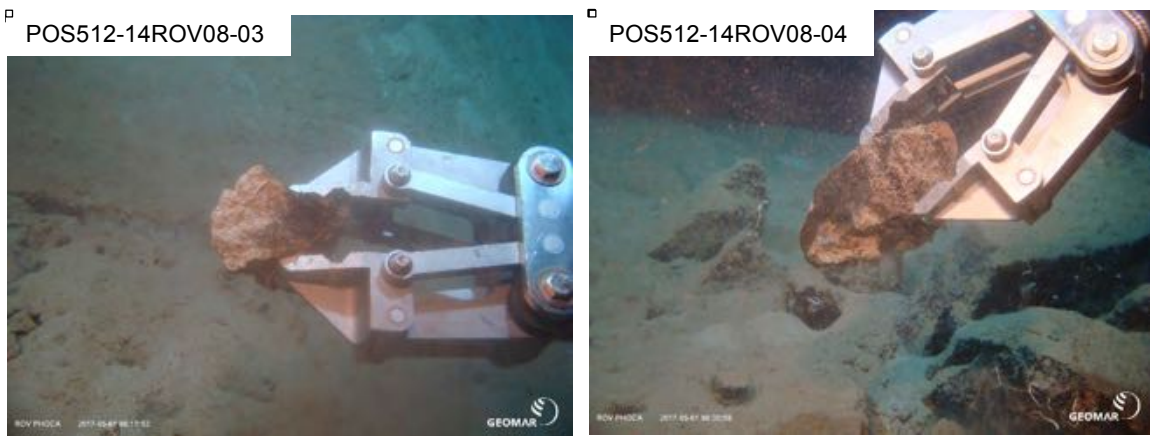
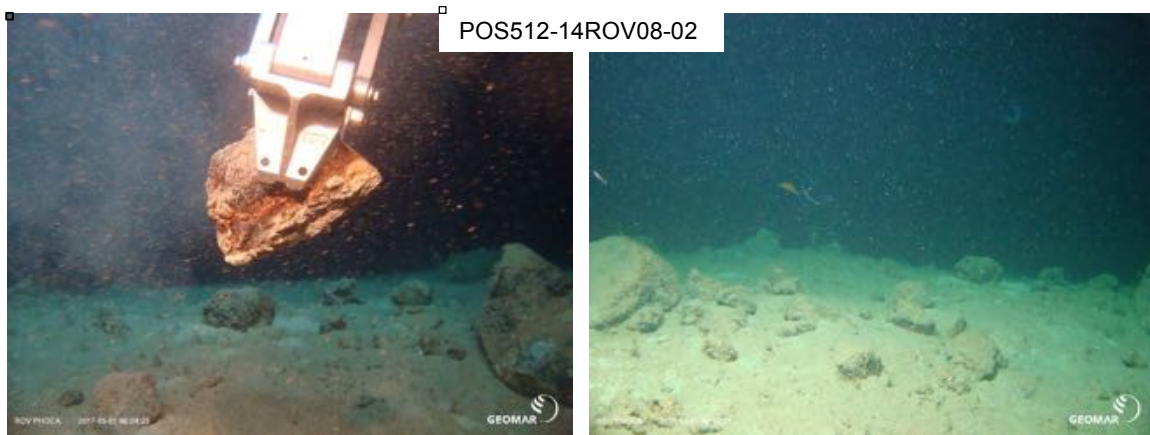
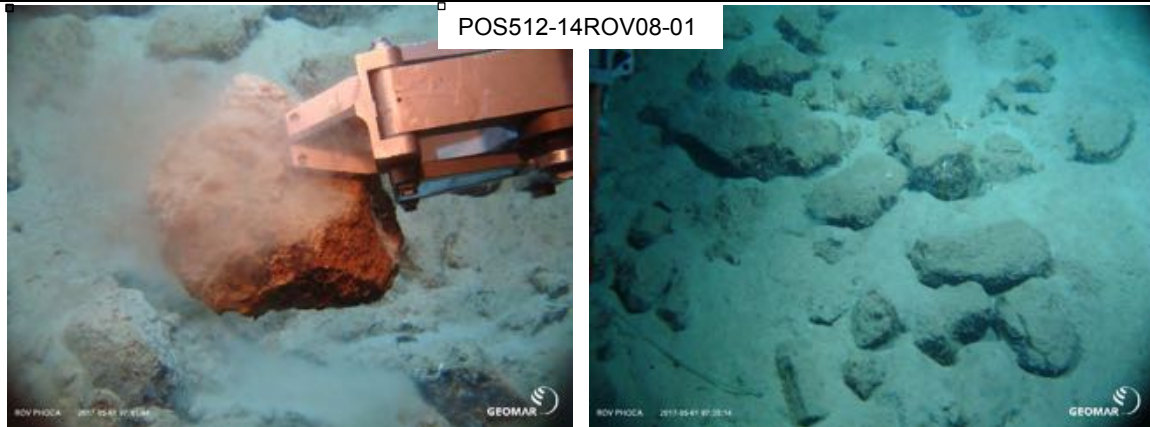


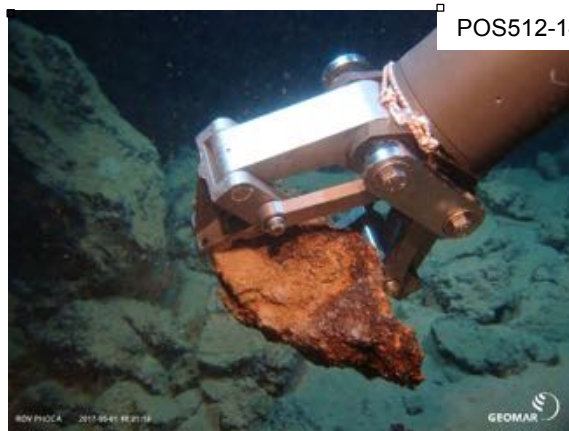
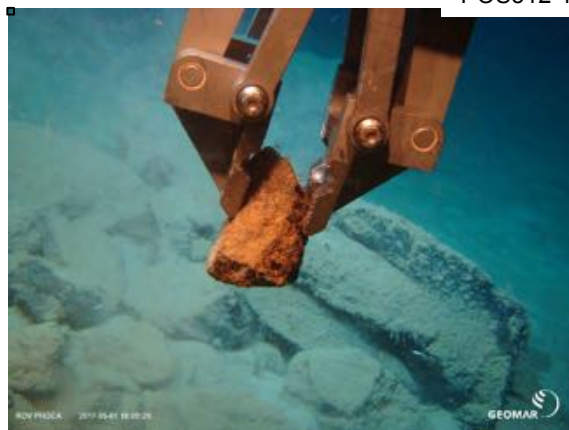
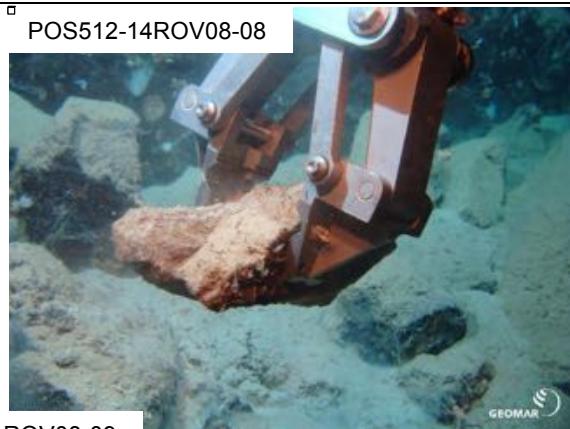


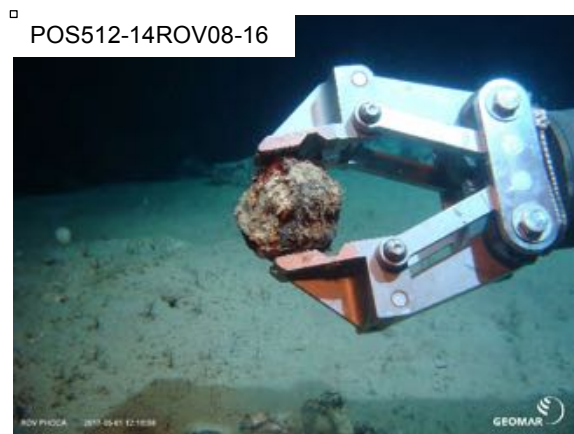
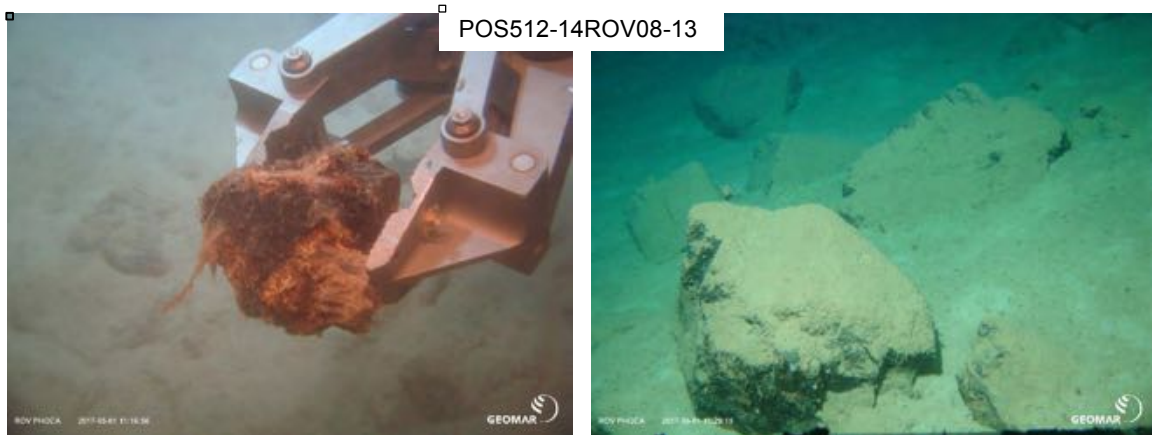
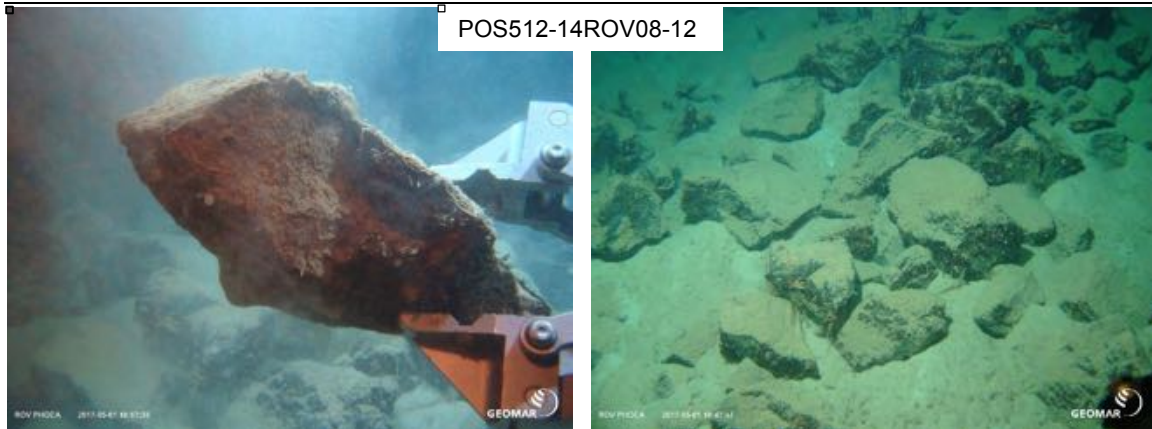
5.3.8 Dive 14ROV08 on the deep SW flank of Volcano 1

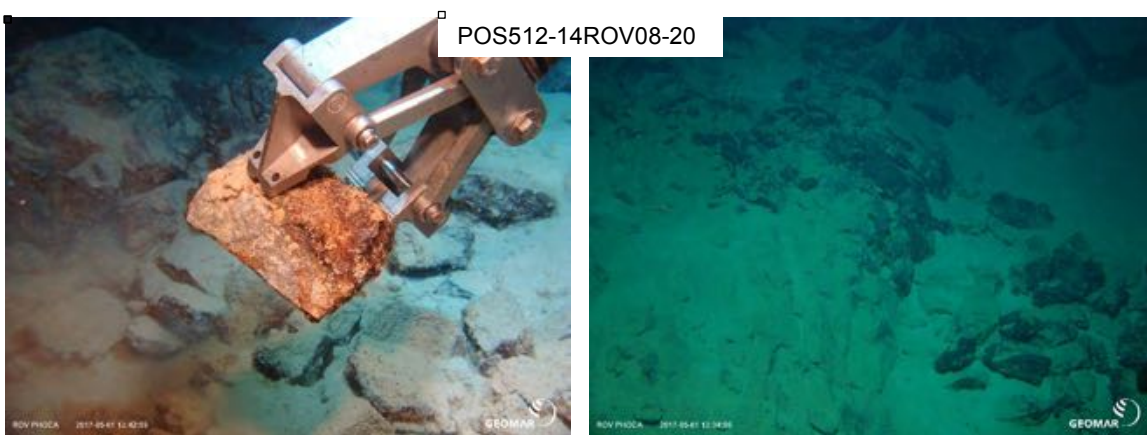
The main objective of the dive was the sampling on the E flank of the Paphsanias Volcano 1 probably one foothill of the volcano which extends towards the W.

Starting at 390 m depth diving eastwards (sample 01-12), then following the 300 m contour line northwards towards the end of the smaller ridge structure (sample 13-16) and again diving eastwards (sample 17-20). The dive started at the bottom of the slope in a sedimentary basin. At the depth of 348 m was the first occurrence of smaller lava blocks. This was followed by much sediment until another debris field with angular lava fragments showed up. The change between sediment and debris fields and possible outcrops repeated during the dive. The size of the possible outcrops increased, the angular lava fragments showed a flow texture. Overall, the samples appeared fresh and due to minor biological coating they appeared relatively young.







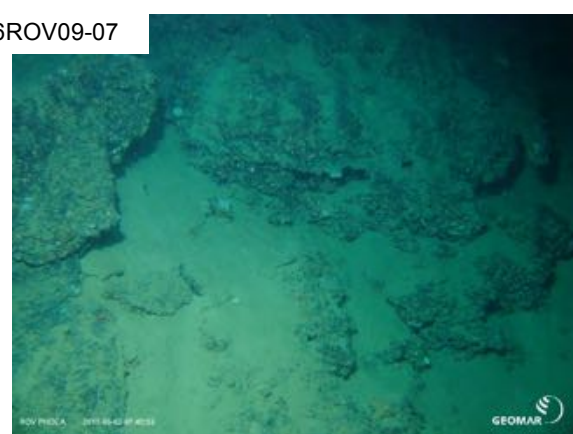


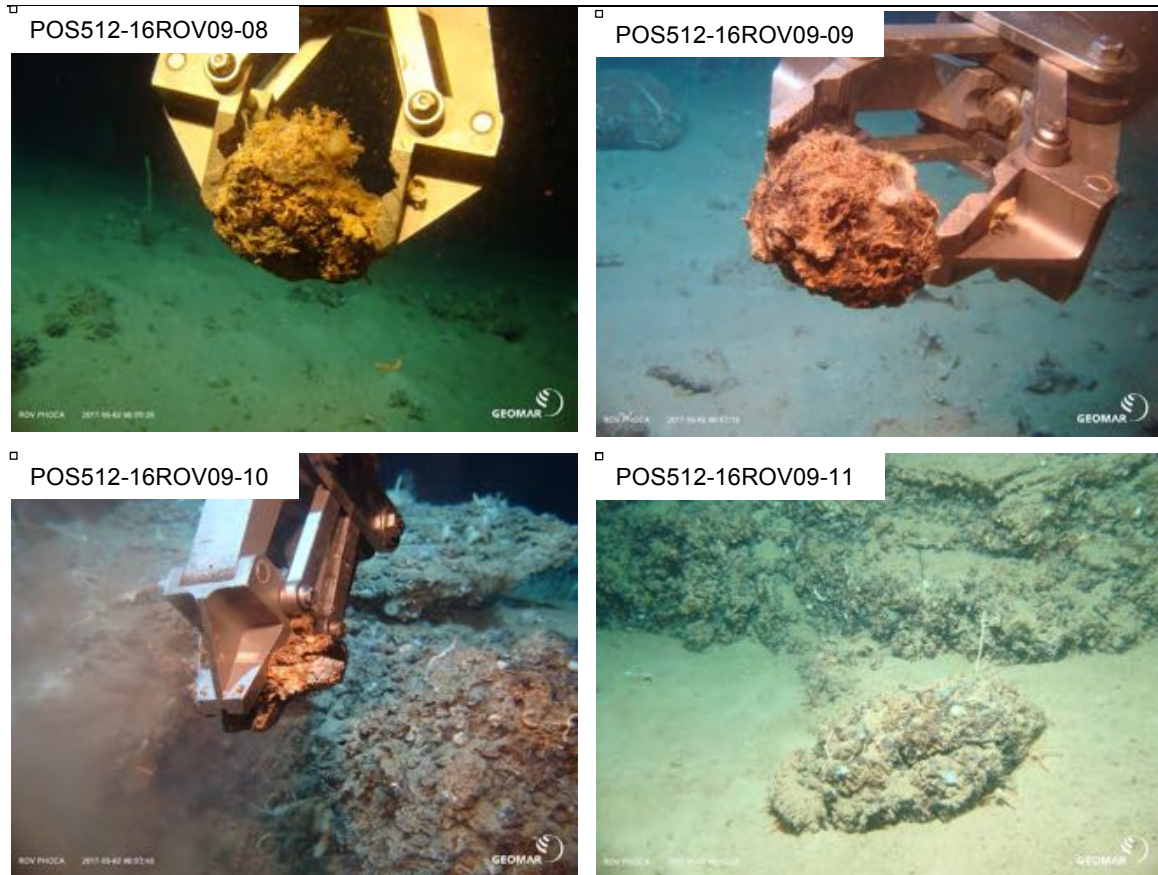
5.3.9 Dive 16ROV09 to the top of Volcano 6

The main objective of the dive was to sample the Paphsanias Volcano 6 starting in the W at 380 m depth moving eastward to the top of the smaller dome-shaped structure.

Starting in a sedimentary basin, diving eastward up the slope. At 333 m depth, several boulders showed up (sample 01) followed by debris fields (sample 02, 03). Approaching the top, possible lava flows alternated with sediment (sample 04-06). On top of the smaller conical structure parallel structured outcrops and smaller sub-rounded rocks were sampled (samples 07-11).

The samples from this dive were strongly covered with biology and appeared sometimes parallel structured with rough surface.





5.3.10 Dive 17ROV10 on the steep cliff off Methana

The main objective of this dive was the survey and sampling of the steep tectonic ridge W of Methana. Starting in a sedimentary basin, moving up the very steep cliff, first SE direction, later on eastward following the edge of the ridge.

At the bottom of the slope some boulders with rough surface appeared, followed by massive flat slabs that were sampled (sample 01A, B). The slope appeared wavy and rippled with some faults, gullies, and conic structures. The rocks seemed to have manganese crusts and biological coating (sample 06, 10). Sometimes the walls showed smooth surfaces and parallel structures (sample 02, 05). Thick sediment layers on the terraces lied above and between the steep cliffs. In general, the sampling was difficult because of the very steep slope, the overhanging rock (sample 04), and the solid and massive slabs.

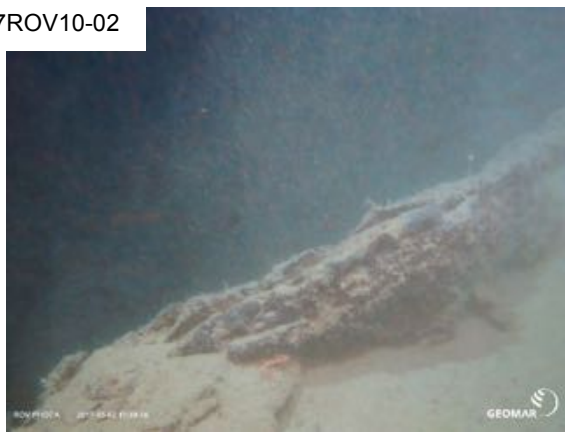
POS512-17ROV10-01A



POS512-17ROV10-01B



POS512-17ROV10-02



POS512-17ROV10-03



POS512-17ROV10-04

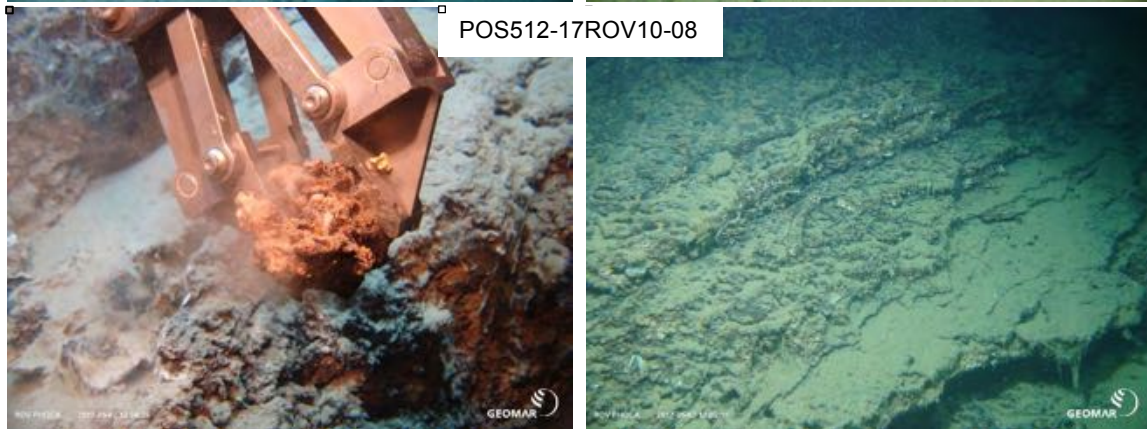
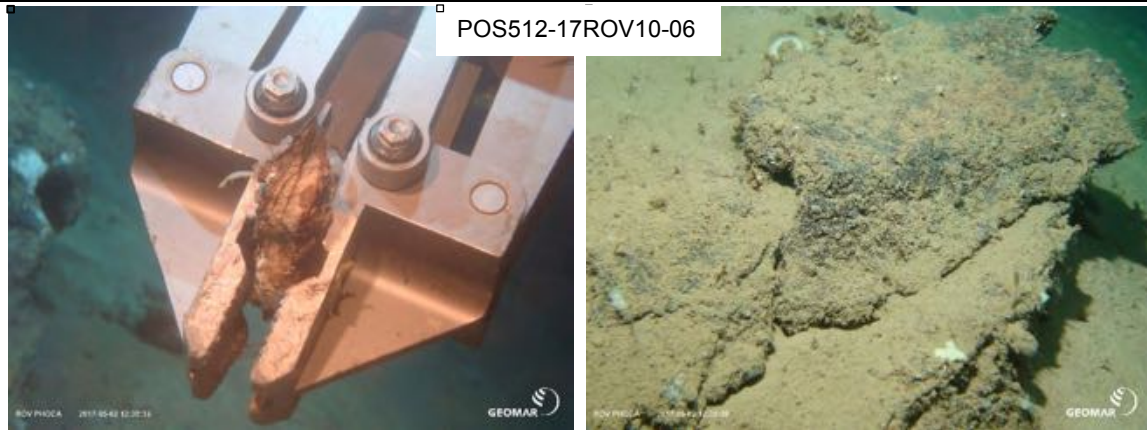


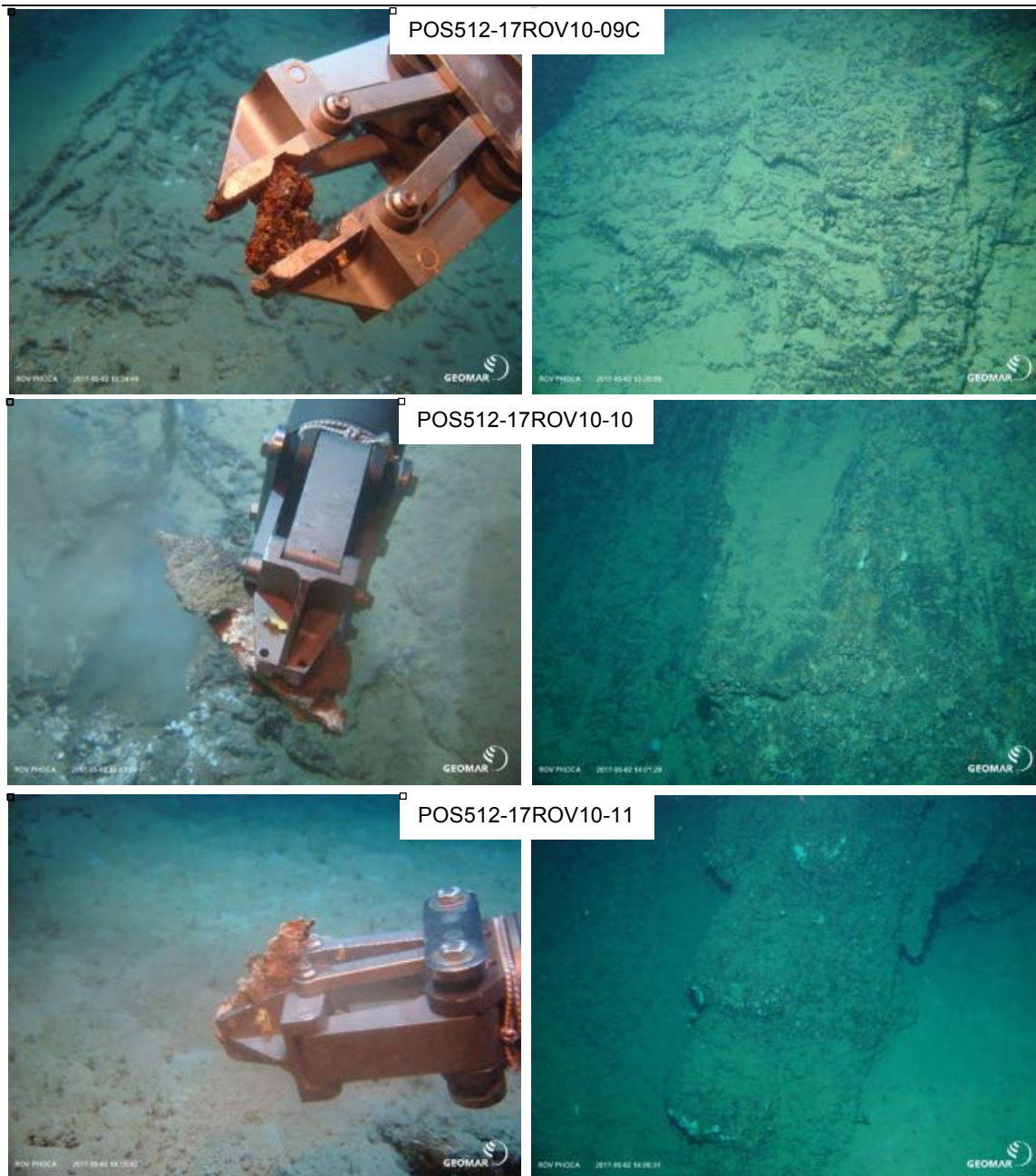
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POS512-17ROV10-05B



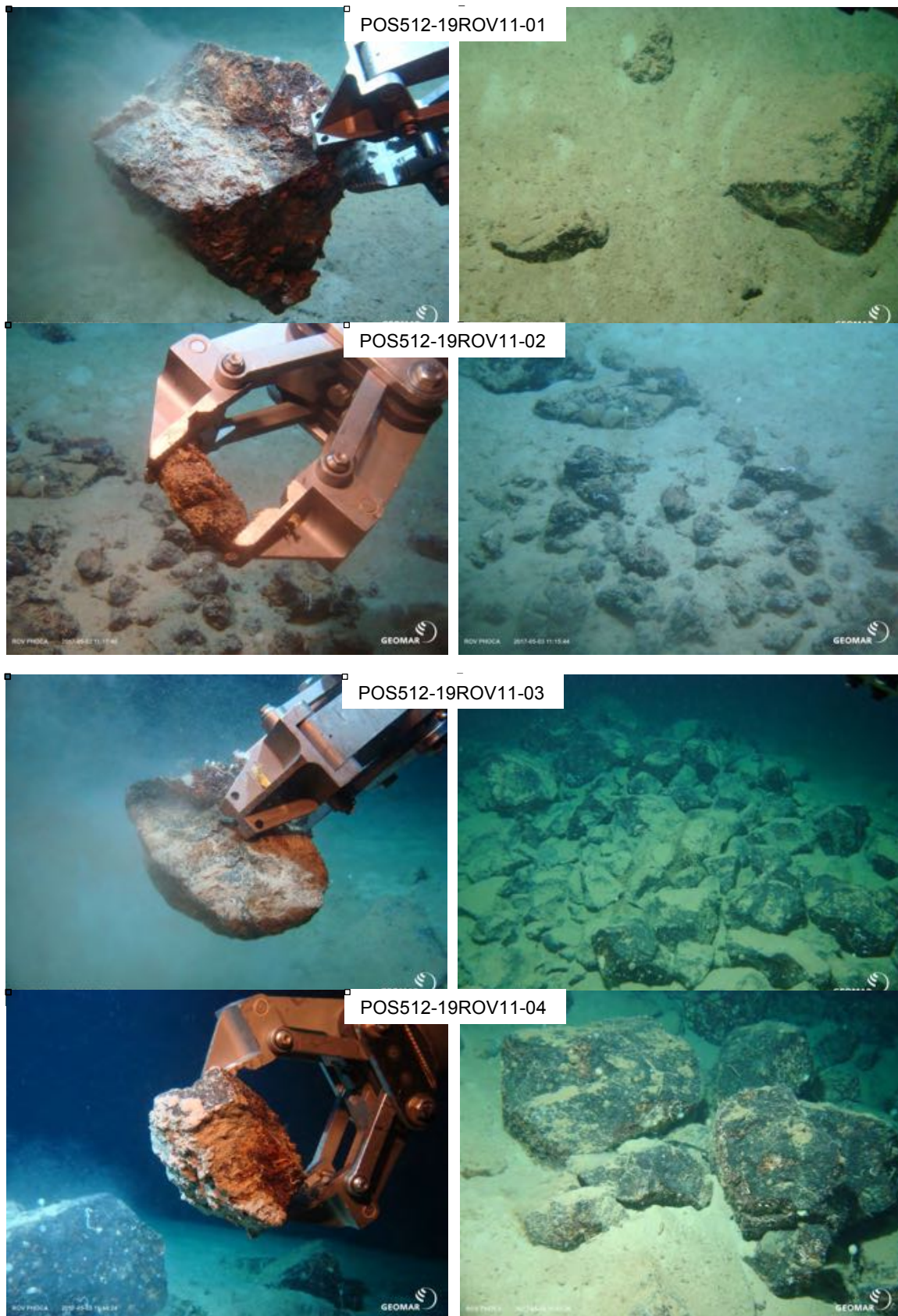


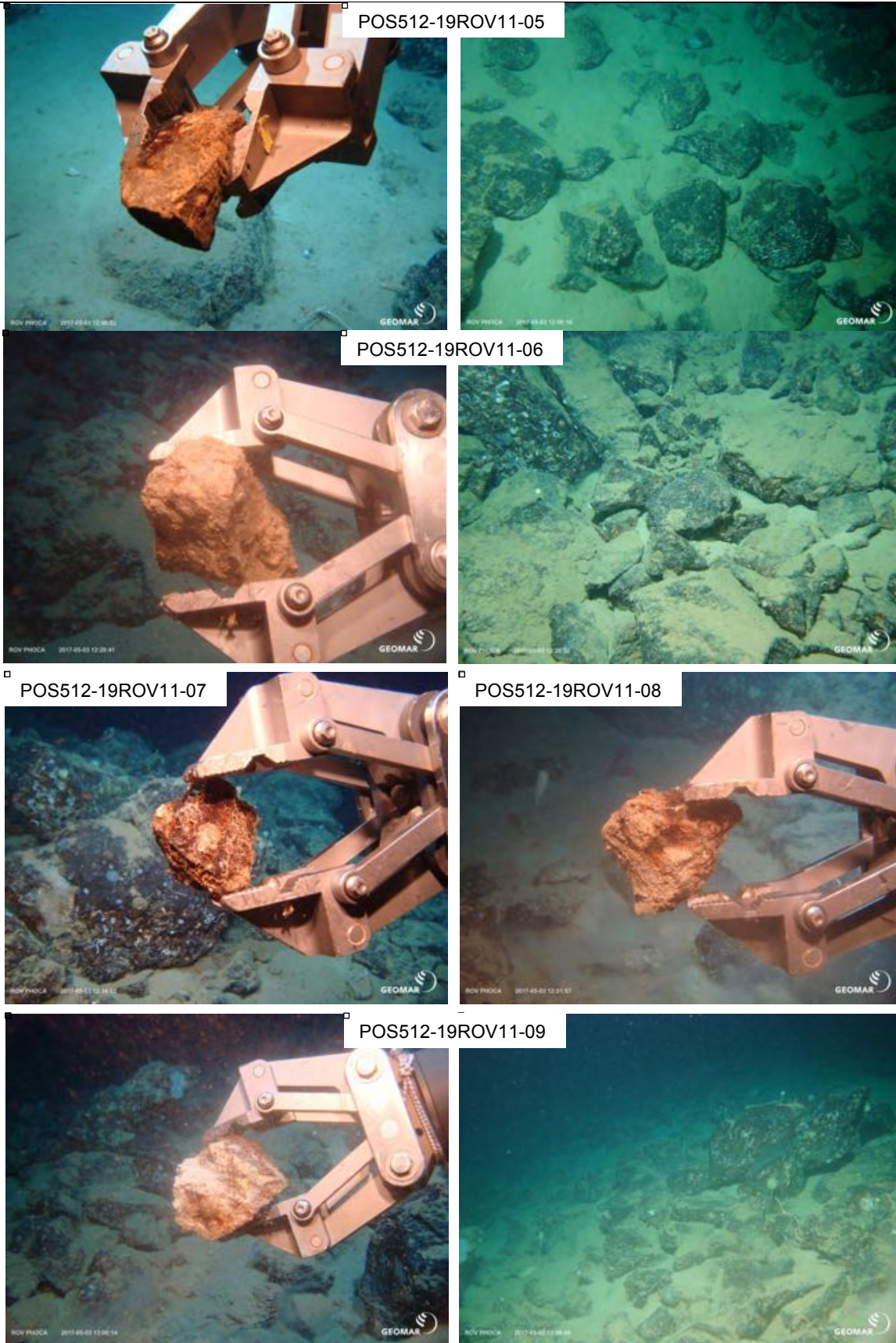


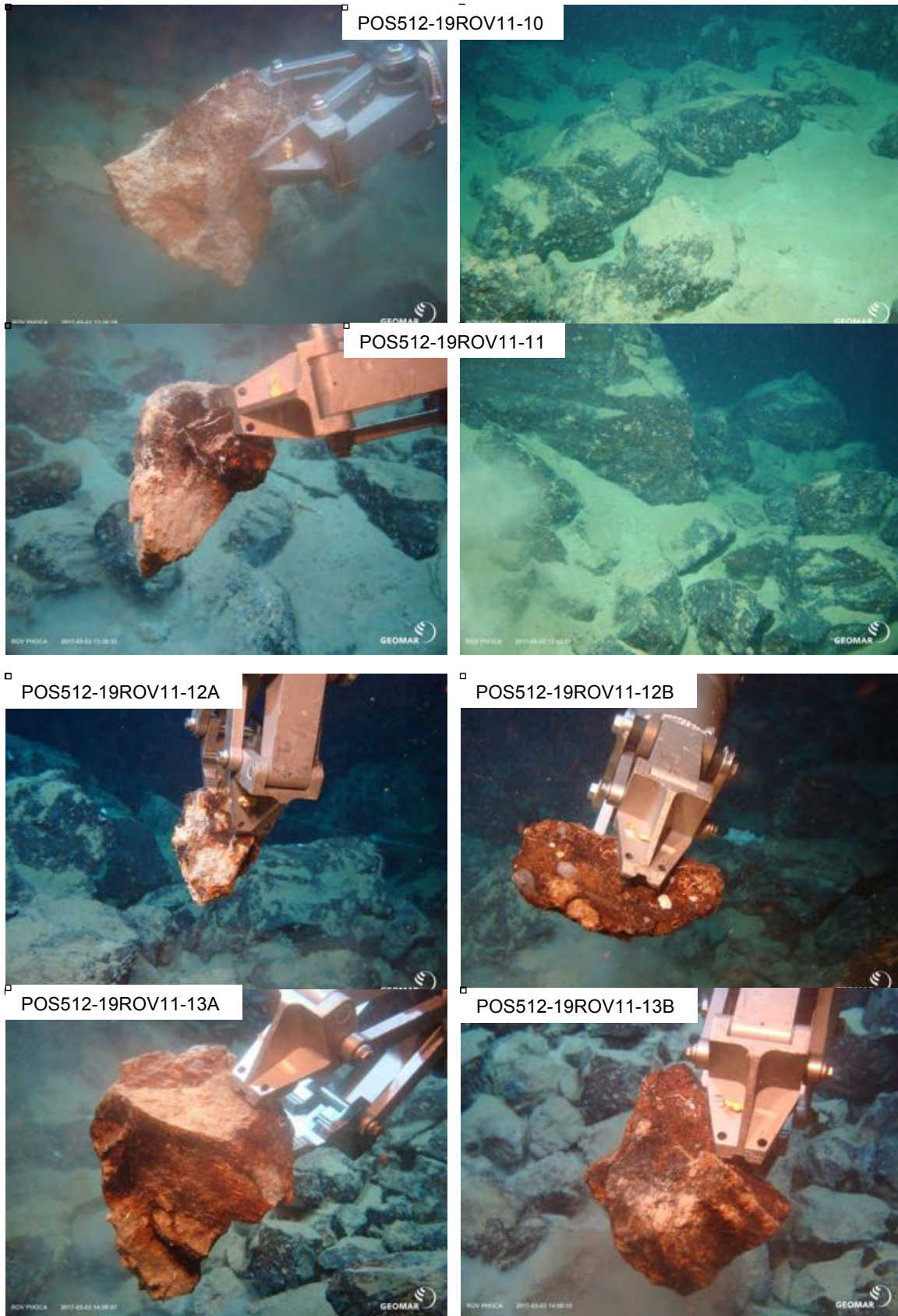
5.3.11 Dive 19ROV11 on the NW flank of Volcano 1

Volcano 1 has a relatively flat NW flank that appears to be disconnected to the main structure and the dive objective was to study the relation between this area and the main crater. The dive started in sediments at a depth of about 300 m and ascended a gentle slope until the first boulders of lava were observed in the sediments. Sampling of these yielded olivine-plagioclase-phyric basaltic rocks (samples 01-05) until reaching a small structure with a depth of 260 m. Continuation of the dive lead across a lava ridge with massive angular lava boulders and talus piles with little sediment cover. Four samples (samples 06-09) taken in this area are andesitic. The dive then turned SE and crossed a talus- and sediment-covered valley and climbed onto the

flank of the Volcano 1 main structure. Again steep and massive lava was observed and sampling of these rocks revealed more andesites (Samples 10 to 13A & B).

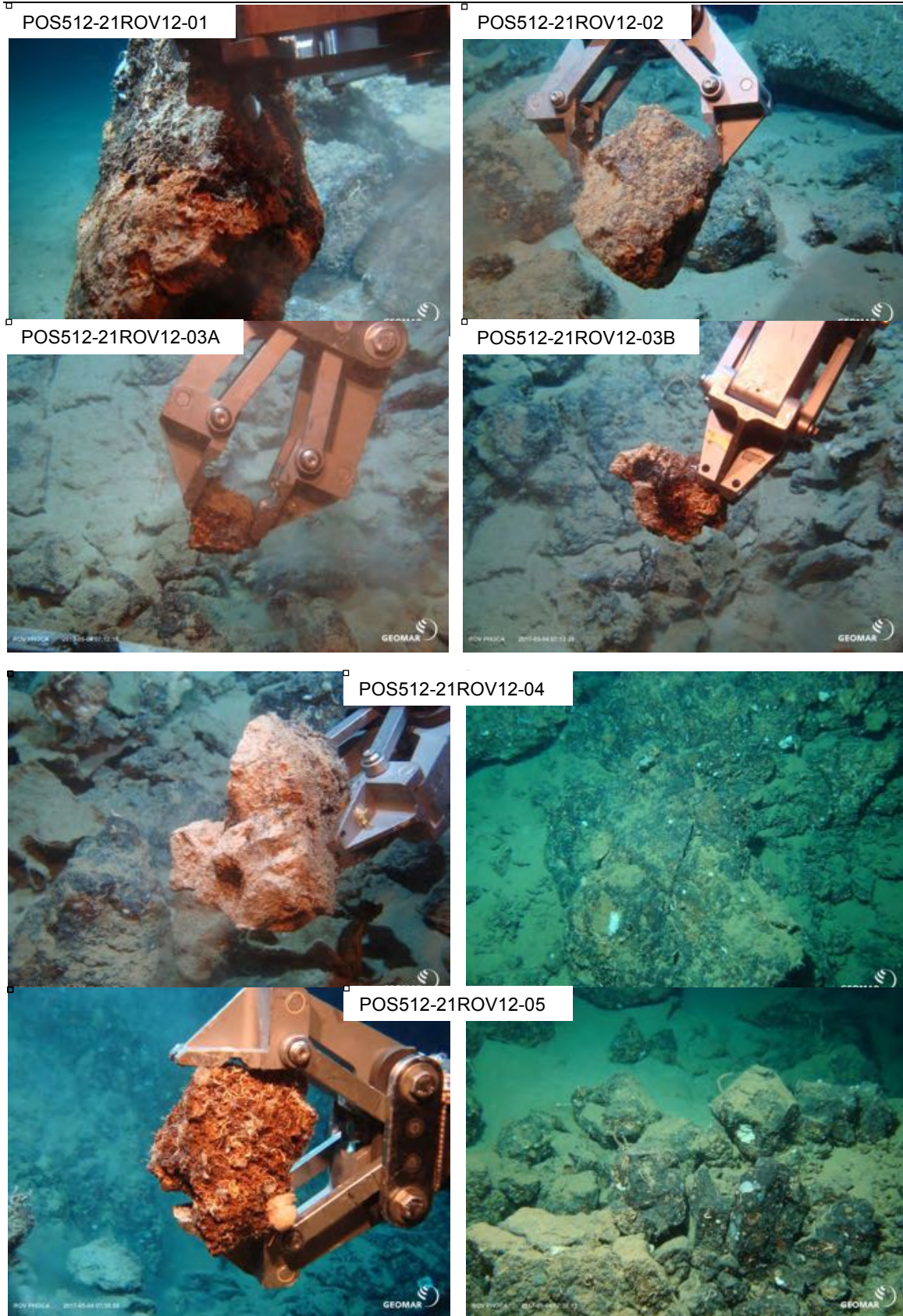


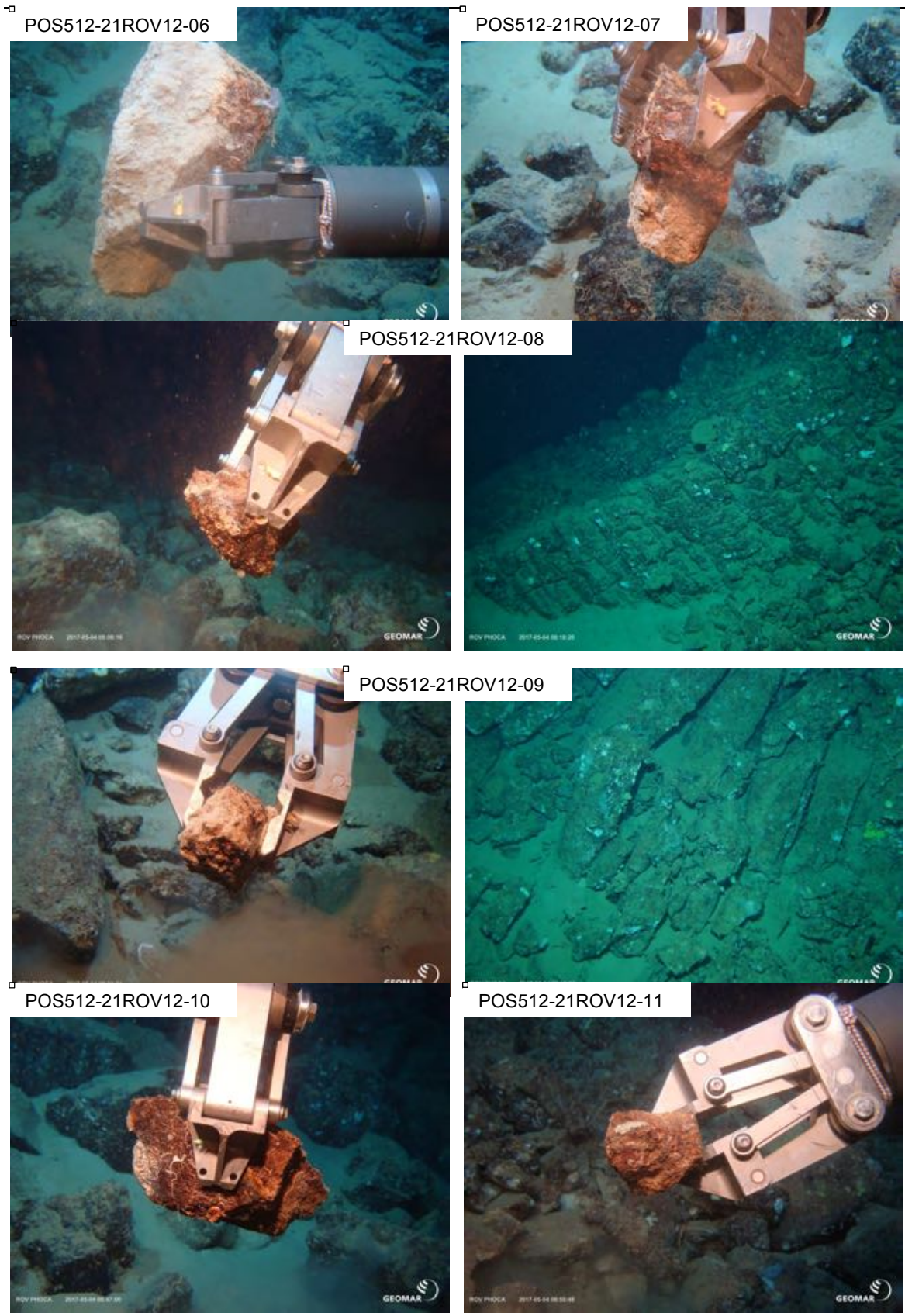


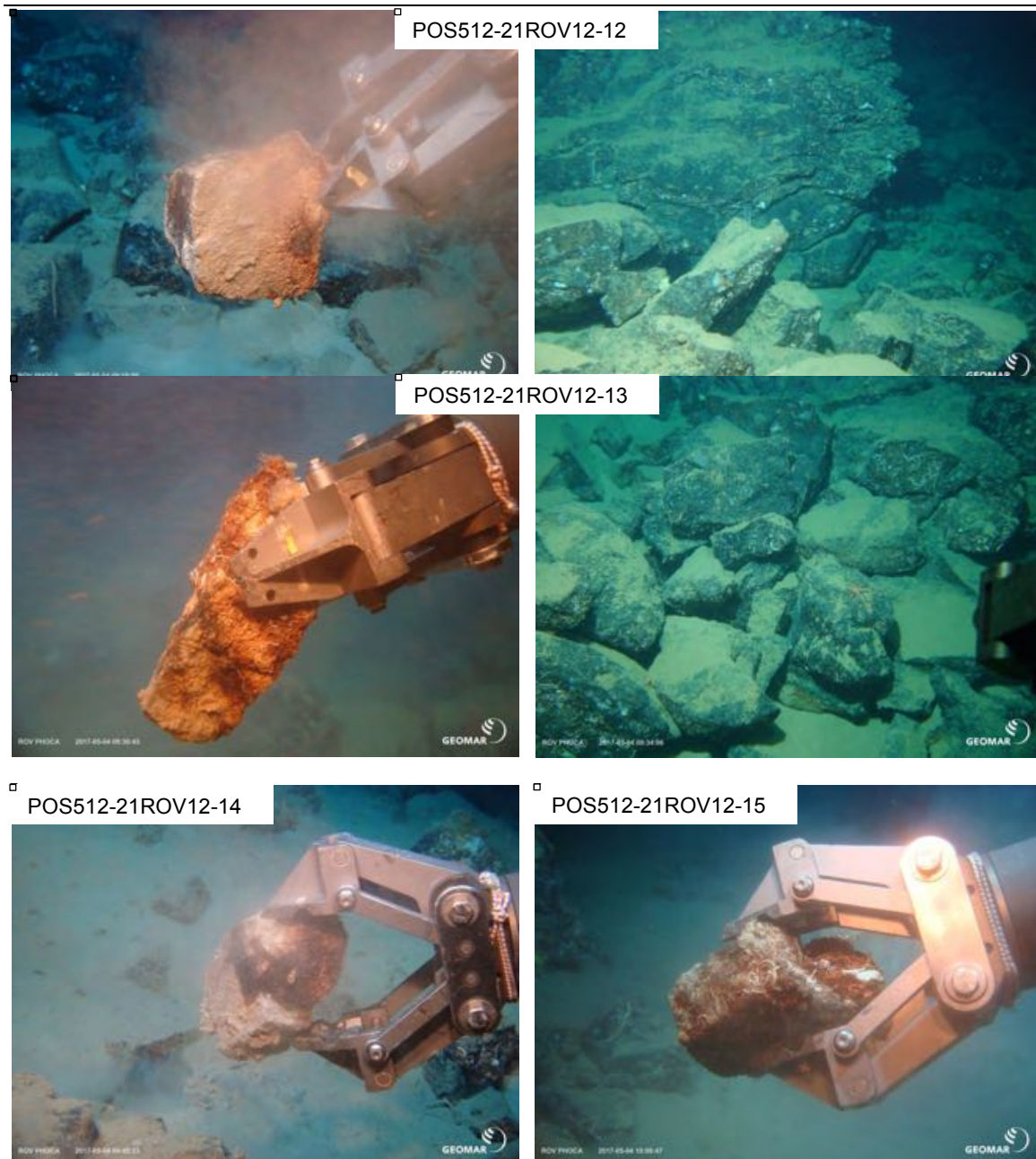


5.3.12 Dive 21ROV12 on the SE flank of Volcano 2

This dive had the objective to survey and sample the SE flank of Volcano 2 and specifically determine whether basaltic lava flows as observed during dive 05ROV03 also occur in this region. The dive started in a sedimented area at the base of the volcano and continued to depths of about 210 m where the first outcrops of lavas were encountered and sampled. Indeed, the first two samples (01, 02) appear to be olivine-plagioclase-phyric basaltic lavas whereas the rocks recovered further up the structure (samples 03 to 15) are all andesitic with phenocrysts of plagioclase, amphibole, and biotite. This flank of the volcano consists of steep lava flow fronts with very rugged surface, slopes with angular and large lava blocks with sediment patches and sedimented flat areas in between.







5.3.13 Dive 22ROV13 on the NW flank of Volcano 6 to the top

The objective of the dive was to obtain more samples of volcanic rocks from Volcano 6 that had been visited before during dive 16ROV09 but only three fresh-looking basaltic lavas were recovered. The dive started on the sedimented NW slope of the volcano and the ROV moved up to the plateau at the top of the structure. Here, firstly smaller patches with irregular large boulders were observed frequently associated with sponges. Sampling of these boulders at water depths of 236 to 218 m recovered only carbonate crusts (samples 01-04) but as we moved further along the plateau we found massive-looking rocks that were sampled and yielded basaltic lavas (samples 05A-C). Sample 06 was taken slightly further to the SW and consists of volcanoclastic breccia with glassy fresh lavas in carbonate cement. The ROV then encountered a large

apparently layered structure of about 6 m height on top of the plateau. Sampling of the outer portion of this boulder yielded mixed carbonate and MnOOH crusts (samples 07-09).

□ POS512-22ROV13-02



□ POS512-22ROV13-03



□ POS512-22ROV13-04



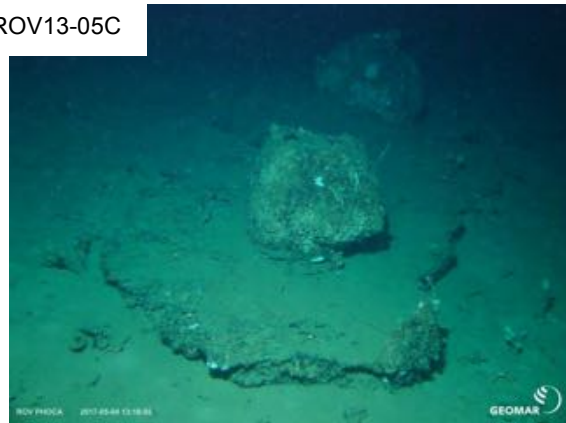
□ POS512-22ROV13-05A

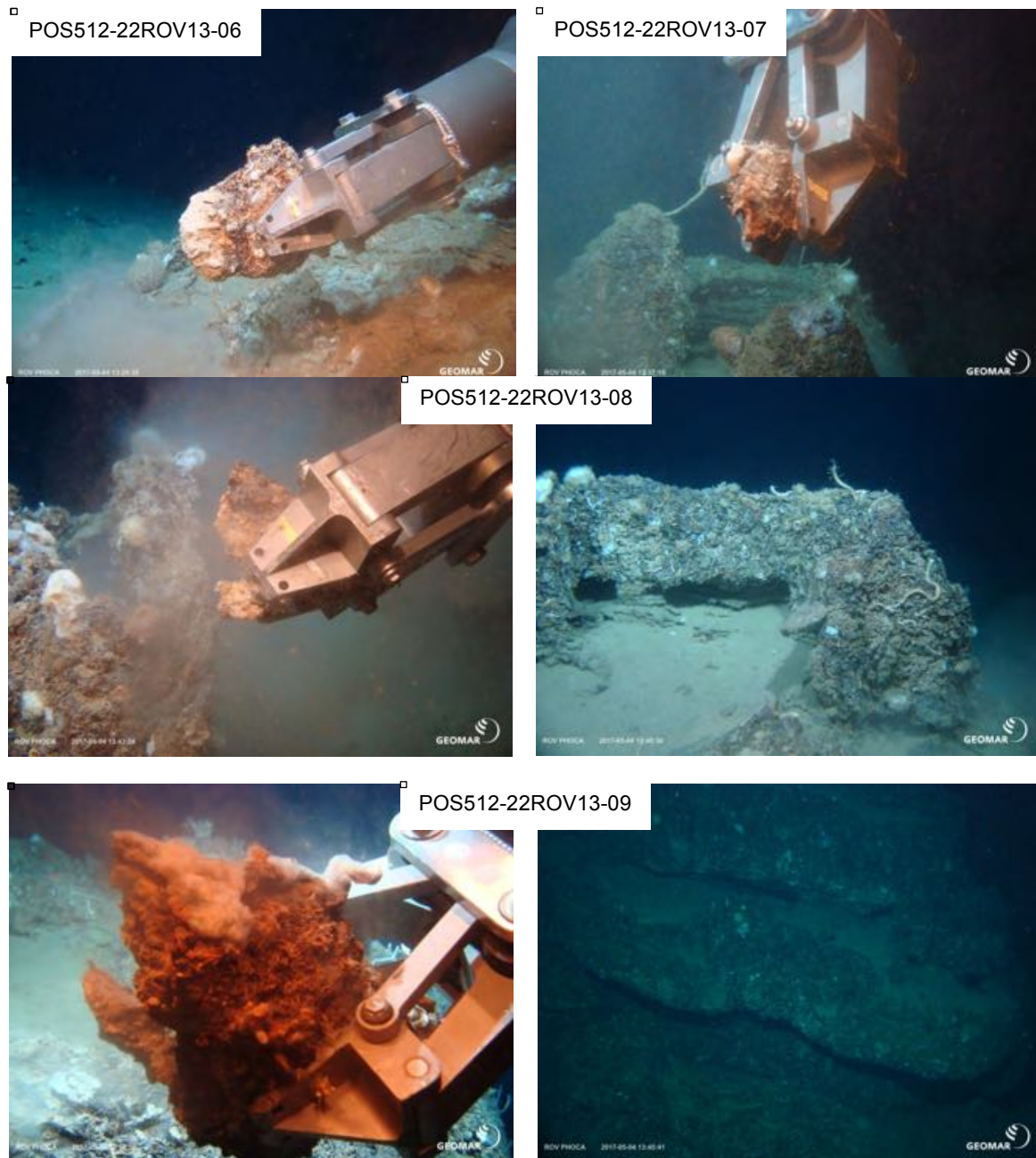


□ POS512-22ROV13-05B



□ POS512-22ROV13-05C





5.4 Preliminary interpretation of observations and petrology of the volcanic rocks (Haase, K.M., Beier, C., Storch, B., Wölki, D.)

5.4.1 Sampling and analytical methods

Seafloor observations and sampling of volcanic rocks during POS512 were carried out with the Remotely Operated Vehicle (ROV) PHOCA of the GEOMAR Helmholtz-Zentrum für Ozeanforschung, Kiel. Sampling with the ROV was based on bathymetric maps and visual observations made during the individual dives. Altogether the 163 samples were recovered during the ROV dives (Fig. 4) and of these 131 were fresh lava samples from four different

volcanic structures. Samples were described on board and packed for petrological and geochemical analyses at the GeoZentrum Nordbayern, Friedrich-Alexander-Universität Erlangen-Nürnberg.

5.4.2 Preliminary results, petrological observations and interpretations

On the basis of the detailed bathymetric map we defined the dive sites for ROV PHOCA in order to visit each of the volcanic and/or tectonic structures between Methana and Agkistri. Preliminary observations and interpretations are the following:

- Volcano 1 is a complex structure with a relatively mafic andesitic older part forming a rounded crater-like structure with a younger apparently dacitic lava dome of about 100 m height. The flanks are heavily sedimented but the rocks are fresh and often covered by Mn-crusts and biological overgrowths. Although the structure is relatively small it consists of several lava units indicating a multi-stage evolution of the volcano. The lavas are generally fresh and range from olivine-bearing basalts to mainly plagioclase-amphibole-biotite-phyric andesites and dacites. Rare volcanoclastic sediments were also observed and sampled but the structure largely consists of effusive lavas.
- Volcano 2 has relatively flat, possibly basaltic lava flows on its southern flank that have a relatively young appearance and less sediment cover than the Volcano 1 units. These mafic lavas are very fine-grained and possibly glassy and contain olivine as a main phase which is unusual compared to the Methana lavas. The shallower portions of the volcano consist of plagioclase-amphibole-biotite-phyric andesites and dacites.
- Volcano 3 has a flat top and steep flanks and thus resembles the lava flows on Methana like that of Mavri Petra. The base of the flow is sedimented but outcrops of angular blocks of lava occur on the deeper parts of the flanks. In the shallow region carbonate crusts of red algae and serpulids cover the outcrops and the thick carbonates are difficult to break with the manipulators of the ROV. The volcano appears to be older than the two northern structures but the recovered rocks are fresh andesites.
- Volcano 4 is a relatively small cone-like volcano west of Volcano 3 and this structure is largely covered by thick sediment and shows only few outcrops at the top but these are completely carbonate-encrusted so that it was impossible to recover lava samples.
- Volcano 5 resembles Volcano 4 and is also sediment-covered with few outcrops of boulders with thick carbonate crusts at the top of the structure. No volcanic rocks were recovered from this volcano.
- Volcano 6 is a slightly elongated cone at the SW end of the Paphsanias Volcanic Field and rises from about 360 m to 220 m water depth. Outcrops of volcanic rocks with

large structures up to 6 m in height occur only at the top of the volcano and were sampled successfully. Dark olivine-clinopyroxene-bearing fine-grained lavas and volcaniclastic breccias were collected on the top and the presence of volcanic bombs seems to indicate mildly explosive eruptions.

- The steep cliffs occurring in the south at the SW end of Methana and in the north close to the island of Agkistri suggest N-S directed rifting of this part of Epidavros Basin. The structures mapped during Pos512 are interpreted as having a dextral strike slip component along the E-W striking main faults of the basin.

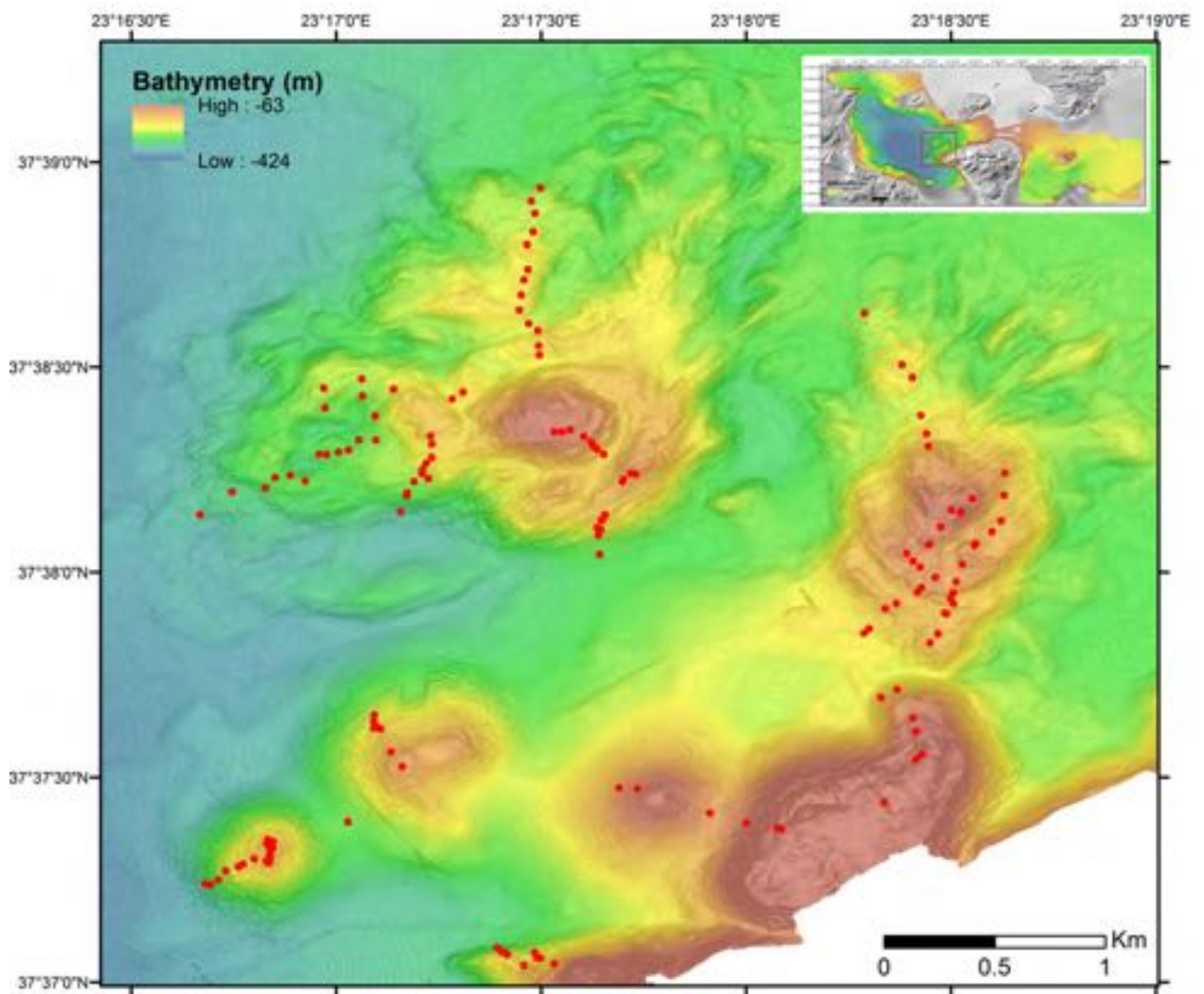


Figure 4. Bathymetric map of the six volcanic structures with the red dots indicating sampling locations along the ROV tracks of POS512.

6 Station List POS512

Station	Date (UTC)	Location	Start (UTC)	Start (Position)		Water depth [m]	Ende (UTC)	End Position		Water depth [m]	comments	Size/ number of samples
				Latitude (°N)	Longitude (°E)			Latitude (°N)	Longitude (°E)			
01-MB	26.-27.04.2107	NW & W of Methana	05:04	37° 39.49'	23° 21.3'	147	05:00	37° 37.32'	23° 17.4'	336	Paphsantias Volcanic Field	
02-ROV01	27.04.17	Volcano 1- SE Flank	05:50	37°37.96'	23°17.61'	338	10:36	37°38.507'	23°17.575'	?	sediments and some rocks at the bottom of the slope, while ascending: lava talus and lava flow outcrops	21 samples, basaltic andesite, andesite and dacitic samples, fresh, 2 consolidated ashes
03-ROV02	27.04.17	Volcano 1- SW Flank	11:14	37°38.222'	23°17.120'	337	14:28	37°38.361'	23°17.212'		sampling crater-like structure and dome-structure of volcano 1	11 samples, 2 sample with maybe glassy matrix, dacite and andesite, fresh

											(similar to dive 02ROV01), partly lava flow outcrops	
04-MB	27.-28.04 2017	W of Methana	14:58	37° 38.64'	23° 17.34'	249	04:21	37° 36.66'	23° 12.06'	276	Epidavros Basin	
05-ROV03	28.04.17	Volcano 2 southern flank	05:37	37°37.83'	23°18.30'	274	10:09	37°38.16'	23°18.557	145	numerous young lava flows & domes, andesites, potentially some pillow lavas, almost everything in situ, biology on top	15 samples, 4 basalt samples and 11 andesitic samples
06-ROV04	28.04.17	Volcano 2 northern flank	10:59	37°38.307	23°18.29	274	14:15	37°38.324	23°18.470'	230	NW flank with small sediment-covered peak and few outcrops, slope of larger volcano,	7 samples, dense basaltic andesite, porphyritic texture, appears fresh

											steep with flow fronts and sedimented terraces	
07-MB	28.-29.04.2017	W & SW of Methana	15:11	37° 36.9'	23° 12'	282	02:39	37° 35.1'	23°18.36'	330	Epidavros Basin	
08-ROV05	29.04.17	Volcano 3 N flank	09:31	37°37.72'	23°18.34'	270	14:03	37°37.46'	23°18.28'	74	Paphsanias Volcano 3 from northern flank, southwards, old lava flows, pebbles and boulders, intercalated with sediments, scoreaceous to volcanoclastic further to the top	8 samples, 3 andesites, fresh, 1 strongly oxidized, 4 carbonate or biological samples (corals, sponges), samples covered with biology and sediment
09-MB	29.-30.04.2017	NW of Methana	14:36	37° 37.68'	23° 18.3'	223,7	04:02	37°40.86'	23° 16.14'	260	Epidavros Basin	

10-ROV06	30.04.17	Paphsanias Volcano 4	05:31	37°37.53'	23°17.58'	362	10:05	37°37.368	23°18.086'	85	Volcano 4 from NW over the top of the smaller cone structure towards SE to the top of the plateau, sediment in turns with talus fields, difficulties to sample, strongly covered with biology	9 samples, mostly carbonates but 3 andesites
11-ROV07	30.04.17	Paphsanias Volcano 5, NW flank to top	11:23	37°37.85'	23°17.01'	360	14:26	37°37.50'	23°17.13'	188	Volcano 5, diving from NW towards the top in SE, mostly sediment with few lava blocks and a handful of andesitic flow	7 samples of carbonate & volcanoclastic breccia

12-MB	30.04.- 01.05.2017	NE & E of Methana	15:04	37°38.31'	23°18.96'	286	03:35	37°35.26'	23°26.64'	255	Basin east of Methana	
13-CTD	01.05.17										Calibration of sound velocity	
14-ROV08	01.05.17	Paphsanias Volcano 1, E flank	06:24	37°38.09'	23°16.35'	380	13:57	37°38.439'	23°17.310'	240	SW Flank of Paphsanias 1, start in sedimentary basin, then talus fields of basalts, moving further to andesitic blocks and lava flows towards the top	20 samples of basaltic to andesitic lava, fresh
15-MB	01.-02.05.2017	E of Methana	14:43	37°39.24'	23°21.84'	123	03:50	37°37.26'	23°26.52'		Basin east of Methana	
16-ROV09	02.05.17	Paphsanias Volcano 6	05:27	37°37.21'	23°16.58'	380	09:48	37°37.41'	23°16.96'	295	Paphsanias 6, approach from SW, sandy sediment at start, few	11 samples, mostly carbonate but 4 lava fragments

											potentially andesitic lava flows, mostly thick sediment covers	
17-ROV10	02.05.17	steep cliff, W of Methana	10:48	37°32.09'	23°17.38'		14:17	37°37.047'	23°17.532'	176	cliff W of Methana, very steep crevasse and rugged surface, mostly Mn-crust and carbonate	15 samples of carbonate and Mn-crust
18-MB	02.-03.05.2017	NE & E of Methana	14:48	37°37.70'	23°17.48'	298	09:49	37°39.06'	23°21.42'	161	Basin east of Methana	
19-ROV-11	03.05.17	Paphsanias Volcano 1, from NW to top	10:38	37°38.99'	23°17.60'	297	14:08	37°38.530'	23°17.496'	246	relatively flat sedimented basaltic lavas flows at base, steeper massive flows and domes higher up the structure	15 samples of lava ranging from basalt to andesite, fresh

20-MB	03.-04.05.2017	N & NW of Methana	14:44	37°39.18'	23°17.10'	336	04:20	37°38.52'	23°22.02'	77	Northern Epidavros Basin	
21-ROV12	04.05.17	Paphsanias Volcano 2, E flank	05:22	37°37.76'	23°18.41'	260	10:11	37°38.240'	23°18.628'	202	moving from the sediment-covered base of the volcano to the flat E flank of the volcano with numerous, only slightly sedimented lava flows	16 samples of lava from basalt to andesite, fresh
22-ROV13	04.05.17	Paphsanias Volcano 6, N to Top	05:25	37°37.77'	23°18.41'	260	13:54	37°37.291'	23°16.837'	213	dive from sediment-covered NW flank of the volcano to the top where large boulders form outcrops of lava but cemented by biogenic carbonate	11 samples, mostly of carbonate and Mn-crust but also 4 samples of fresh basaltic lava

											and Mn crust	
23-MB	04.-05.5.2017										NW Epidavros Basin	

7 Data and Sample Storage and Availability

All bathymetric data were collected by the group from the University of Athens and they are currently being processed. Data are stored in facilities of the Deutsches Klimarechenzentrum. Metadata of the on-board DSHIP-System will be uploaded to a World Data Center (e.g. PANGAEA) which provides a long-term archive and access to the data. Multi-beam field data are stored at the bathymetric data centre of the Bundesamt für Seeschifffahrt und Hydrografie, however, these data are protected until the end of 2019. The petrological samples will be stored at the GeoZentrum Nordbayern, Friedrich-Alexander-Universität Erlangen-Nürnberg. The petrological and geochemical data will be published in peer-reviewed journals and will be available in international databases such as GEOROC and PetDB.

8 Acknowledgements

We gratefully acknowledge the help of the Foreign Office in Berlin, the German embassy in Athens and the Leitstelle Deutsche Forschungsschiffe in Hamburg in achieving the research permission. We thank the Ministry of Foreign Affairs of the Hellenic Republic for permission to conduct the research cruise in Greek waters and Prof. E. Nomikou for her help before and during the cruise. The cruise was supported by grant HA2568/36-1 of the Deutsche Forschungsgemeinschaft (DFG). We thank Captain Helge Volland and his crew for their help in carrying out a successful cruise and for the pleasant and professional atmosphere on R/V Poseidon.

9 References

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- Wölki, D., 2016. The influence of sediments in mantle melting at subduction zones: Evidence stored in mafic lavas and enclaves from Methana, Aegean arc, Friedrich-Alexander-Universität Erlangen-Nürnberg, 40 pp.

10 POS512 sample list and description

POS512-02ROV01-01



Locality description: Volcano 1, SE flank
 Lat.: 37°38,043'N
 Long.: 23°17,643'E
 Depth [m]: 273
 Date/Time [UTC]: 27.04.17/06:39

Sample description: One small sample (basaltic) with fine; partly glassy dark matrix; porphyritic with Plag. (2%/1-3mm), Amph. and Bt. (1%/0.5-1mm) phenocrysts; about 2% sub-rounded to angular (0.5mm) vesicles; biological and carbonate crust; debris

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-02



Locality description: Volcano 1, SE flank
 Lat.: 37°38,091'N
 Long.: 23°17,640'E
 Depth [m]: 273
 Date/Time [UTC]: 27.04.17/06:49



Sample description: One small sample (basaltic) with mafic, partly glassy matrix and greyish dacitic rim; porphyritic with Plag. (5-10%/1-6mm), Qtz. (3%/1-3mm), Amph. and Bt. phenocrysts; about 10% round to elongated (0.5-1mm) vesicles; carbonate and biological crust; debris

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-03



Locality description: Volcano 1, SE flank
 Lat.: 37°38,104'N
 Long.: 23°17,646'E
 Depth [m]: 259
 Date/Time [UTC]: 27.04.17/06:57

	<p>Sample description: One sample (basaltic-andesitic) with fine matrix; porphyritic with Plag. (22%/0.5-1mm) phenocrysts; about 20-25% elongated to angular (<1mm) vesicles; manganese, iron, biological and carbonate crust; debris</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-02ROV01-04</p>	
	<p>Locality description: Volcano 1, SE flank Lat.: 37°38,109'N Long.: 23°17,637'E Depth [m]: 250 Date/Time [UTC]: 04.27.17/07:04</p> <p>Sample description: One sample (volcanoclastic ash) with fine matrix; layered; red color; biological crust; pebble</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-02ROV01-05A</p>	
	<p>Locality description: Volcano 1, SE flank Lat.: 37°38,126'N Long.: 23°17,647'E Depth [m]: 230 Date/Time [UTC]: 27.04.17/07:24</p> <p>Sample description: One rounded sample (andesitic) with fine matrix; porphyritic with Plag. (3%/1-2mm), Px. 2-3%/1mm) and Qtz. (1-2%/3-4mm) phenocrysts; about 3-4% rounded (1-2mm) vesicles; manganese, iron and biological crust; debris.</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-02ROV01-5B</p>	



Locality description: Volcano 1, SE flank
 Lat.: 37°38,126'N
 Long.: 23°17,649'E
 Depth [m]: 230
 Date/Time [UTC]: 27.04.17/07:24

Sample description: One sub-rounded sample (andesitic-dacitic) with fine greyish matrix; porphyritic with Plag. (5-8%/2-4mm), Px. (20%/1-3mm) and Amph (2%/<1mm) phenocrysts; about 25% sub-rounded to angular (1-2mm) vesicles; manganese, iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-06



Locality description: Volcano 1, SE flank
 Lat.: 37°38,139'N
 Long.: 23°17,657'E
 Depth [m]: 225
 Date/Time [UTC]: 27.04.17/07:32

Sample description: One angular dense sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag. (3-4%/1-2mm), Qtz. (5%/2-3mm) and Amph (5-8%/<1mm) phenocrysts; about 20% round (<1mm) vesicles; manganese, iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-07



Locality description: Volcano 1, SE flank
 Lat.: 37°38,140'N
 Long.: 23°17,656'E
 Depth [m]: 218
 Date/Time [UTC]: 27.04.17/07:49

Sample description: One sample greyish consolidated ash with fine matrix; ash with some small black minerals; manganese, iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-08



Locality description: Volcano 1, SE flank
 Lat.: 37°38,221'N
 Long.: 23°17,699'E
 Depth [m]: 203
 Date/Time [UTC]: 27.04.17/08:12

Sample description: One dense sample (basaltic-andesitic) with fine matrix; porphyritic with Plag (10%/1-3mm), Qtz (3%/1-2mm), Px (7.5%/<1mm) and Amph (7.5%/<1mm) phenocrysts; about 5% elongated to angular (1-2mm) vesicles; iron and biological crust; debris/sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-09



Locality description: Volcano 1, SE flank
 Lat.: 37°38,226'N
 Long.: 23°17,701'E
 Depth [m]: 201
 Date/Time [UTC]: 27.04.17/08:20

Sample description: One dense angular sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag (5-8%/1-2mm), Qtz (3%/1-2mm) and Px (8%/<1mm) phenocrysts; manganese, iron and biological crust; debris/sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-10A



Locality description: Volcano 1, SE flank
 Lat.: 37°38,239'N
 Long.: 23°17,731'E
 Depth [m]: 189
 Date/Time [UTC]: 27.04.17/08:34

Sample description: One small dense altered sample (andesitic-dacitic) with fine matrix; porphyritic with Plag (15%/2-4mm), Qtz (3%/2-3mm), Amph (2%/2-4mm) and Bt phenocrysts; manganese, iron and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-10B



Locality description: Volcano 1, SE flank
 Lat.: 37°38,239'N
 Long.: 23°17,731'E
 Depth [m]: 189
 Date/Time [UTC]: 27.04.17/08:34

Sample description: One small dense sample (andesitic-dacitic) with fine matrix; porphyritic with Plag. (15%/2-3mm), Qtz. (2-3%/2-3mm), Amph (2%/2-3mm) and Bt. phenocrysts; manganese, iron and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-11



Locality description: Volcano 1, SE flank
 Lat.: 37°38,241'N
 Long.: 23°17,719'E
 Depth [m]: 188
 Date/Time [UTC]: 27.04.17/08:45

Sample description: One large elongated slightly altered sample (andesitic-dacitic) with fine grey matrix; porphyritic with Plag. (35%/1-5mm), Qtz. (2%/2mm), Px., Amph (5-10%/<1mm) and Bt. (10%/1-5mm) phenocrysts; manganese, iron and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-12



Locality description: Volcano 1, SE flank
 Lat.: 37°38,287'N
 Long.: 23°17,653'E
 Depth [m]: 220
 Date/Time [UTC]: 27.04.17/09:07

Sample description: One large dense elongated sample (andesitic-dacitic) with fine grey matrix and mafic enclaves; porphyritic with Plag. (18%/1-2cm), Qtz. (5%/2-4mm), Amph (4%/1-5mm), Bt. (4%/2-5mm) and Ol. phenocrysts; manganese, iron and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-13



Locality description: Volcano 1, SE flank
 Lat.: 37°38,300'N
 Long.: 23°17,637'E
 Depth [m]: 202
 Date/Time [UTC]: 27.04.17/09:13

Sample description: One small dense sample (andesitic-dacitic) with fine grey matrix; porphyritic with Plag. (10%/2-4mm), Qtz. (5%/2-3mm), Amph (3%/2-4mm) and Bt. (3%/<2mm) phenocrysts; manganese, iron and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-14



Locality description: Volcano 1, SE flank
 Lat.: 37°38,307'N
 Long.: 23°17,628'E
 Depth [m]: 187
 Date/Time [UTC]: 27.04.17/09:21

Sample description: One angular dense sample (andesitic-dacitic), altered with fine matrix; porphyritic with Plag. (8%/2-5mm), Qtz. (5%/2-5mm), Amph (3%/2-3mm) and Bt. (3%/2-4mm) phenocrysts; manganese, iron and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-15



Locality description: Volcano 1, SE flank

Lat.: 37°38,317'N

Long.: 23°17,622'E

Depth [m]: 181

Date/Time [UTC]: 27.04.17/09:26

Sample description: One angular dense sample (andesitic-dacitic) with strongly altered coating and fine grey matrix; porphyritic with Plag. (8%/2-5mm), Qtz. (1-2%/1-2mm), Amph (3%/2-4mm) and Bt. (2%/2-3mm) phenocrysts; manganese, iron and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-16



Locality description: Volcano 1, SE flank

Lat.: 37°38,331'N

Long.: 23°17,605'E

Depth [m]: 170

Date/Time [UTC]: 27.04.17/09:35

Sample description: One flat dense sample (andesitic-dacitic) with fine matrix; porphyritic with Plag. (13%/2-8mm), Qtz. (5%/2-4mm), Amph (3%/1-2mm) and Bt. (2%/2mm) phenocrysts; iron, carbonatic and biological crust; sheet.

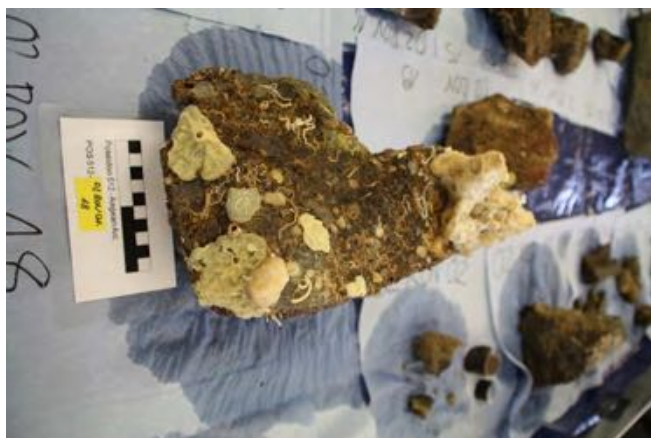
Samples at: GeoZentrum Nordbayern

POS512-02ROV01-17

Locality description: Volcano 1, SE flank
 Lat.: 37°38,347'N
 Long.: 23°17,571'E
 Depth [m]: 156
 Date/Time [UTC]: 27.04.17/09:45

Sample description: One angular elongated dense sample (andesitic-dacitic) with fine grey matrix; porphyritic with Plag. (12%/2-8mm), Qtz. (2%/2-3mm), Amph (2%/1-2mm) and Bt. (1-2%/<3mm) phenocrysts; manganese, iron carbonatic and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-18

Locality description: Volcano 1, SE flank
 Lat.: 37°38,342'N
 Long.: 23°17,551'E
 Depth [m]: 154
 Date/Time [UTC]: 27.04.17/09:58

Sample description: One large angular sample (andesitic-dacitic) with fine grey matrix; porphyritic with Plag. (10%/2-4mm), Qtz. (2%/<2mm), Amph (5%/1-2mm) and Bt. (1-2%/<2mm) phenocrysts; manganese, iron, carbonatic and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-02ROV01-19

Locality description: Volcano 1, SE flank
 Lat.: 37°38,342'N
 Long.: 23°17,532'E
 Depth [m]: 149
 Date/Time [UTC]: 27.04.17/10:09

Sample description: One large angular dense sample (andesitic-dacitic) with fine grey matrix, porphyritic with Plag. (12%/2-8mm), Qtz. (2%/<2mm), Amph (8%/1-2mm) and Bt. (1-2%/2-4mm) phenocrysts; manganese, iron,

carbonatic and biological crust; sheet.

POS512-03ROV02-01



Locality description: Volcano 1, SW flank
 Lat.: 37°38,148'N
 Long.: 23°17,157'E
 Depth [m]: 334
 Date/Time [UTC]: 27.04.17/11:51

Sample description: One sample (andesitic), possible pillow lava sector with fine matrix; porphyritic with Plag. (20%/<10mm) and Amph (5%/<5mm) phenocrysts; about 10% elongated (<30mm) vesicles; manganese and biological crust; pillow (?).

Samples at: GeoZentrum Nordbayern

POS512-03ROV02-02



Locality description: Volcano 1, SW flank
 Lat.: 37°38,186'N
 Long.: 23°17,172'E
 Depth [m]: 304
 Date/Time [UTC]: 27.04.17/12:18

Sample description: One small massive sample (andesitic) with fine matrix; porphyritic with Plag. (20%/<5mm), Amph (2%/<5mm) and Bt. phenocrysts. about 10% elongated (10mm) vesicles; manganese and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-03ROV02-03



Locality description: Volcano 1, SW flank
 Lat.: 37°38,193'N
 Long.: 23°17,173'E
 Depth [m]: 297
 Date/Time [UTC]: 27.04.17/12:23

Sample description: One sample (andesitic) with slightly altered coating and fine matrix; porphyritic with Plag. (10%/<8mm), Amph (5%/<5mm) and Bt. (5%/<3mm) phenocrysts; about 10% round to elongated (<5mm) vesicles; manganese and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-03ROV02-04



Locality description: Volcano 1, SW flank
 Lat.: 37°38,221'N
 Long.: 23°17,190'E
 Depth [m]: 287
 Date/Time [UTC]: 27.04.17/12:31

Sample description: One sample (andesitic) slightly altered with medium matrix; porphyritic with Plag. (15%/5-8mm), Amph (5%/<5mm) and Bt. phenocrysts; about 10% elongated (1mm) vesicles; manganese and clay crust; block.


Samples at: GeoZentrum Nordbayern

POS512-03ROV02-05



Locality description: Volcano 1, SW flank
 Lat.: 37°38,240'N
 Long.: 23°17,210'E
 Depth [m]: 277
 Date/Time [UTC]: 27.04.17/12:41

Sample description: One slightly altered sample (basaltic-andesitic) possibly pillow lava sector with fine matrix; porphyritic with Plag. (20%/<1cm), Amph (5%/0.5-1mm), Bt. (1%/1mm) and Qtz. phenocrysts; about 5-10%

	<p>elongated (5-10mm) vesicles; manganese and biological crust; pillow (?).</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-03ROV02-06</p>	
	<p>Locality description: Volcano 1, SW flank Lat.: 37°38,251'N Long.: 23°17,211'E Depth [m]: 265 Date/Time [UTC]: 27.04.17/12:52</p> <p>Sample description: One larger fresh sample (dacitic) with fine grey matrix; porphyritic with Plag. (20%/2-12mm), Amph (3%/2-5mm), Bt. (2%/2-4mm) and Qtz. (5%/2-3mm) phenocrysts; about 3% elongated (1-2mm) vesicles with floating structures; manganese, iron, carbonatic and biological crust; debris/sheet.</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-03ROV02-07</p>	
	<p>Locality description: Volcano 1, SW flank Lat.: 37°38,266'N Long.: 23°17,220'E Depth [m]: 261 Date/Time [UTC]: 27.04.17/13:00</p> <p>Sample description: One flat dense sample (dacitic), slightly altered with fine grey matrix; porphyritic with Plag. (14%/2-5mm), Amph (3%/1-3mm), Bt. (2%/2mm) and Qtz. (3%/3-5mm) phenocrysts; manganese, iron and biological crust; debris/sheet.</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-03ROV02-08</p>	



Locality description: Volcano 1, SW flank
 Lat.: 37°38,280'N
 Long.: 23°17,233'E
 Depth [m]: 250
 Date/Time [UTC]: 27.04.17/13:26

Sample description: One angular dense sample (dacitic), slightly altered with fine grey matrix; porphyritic with Plag. (8-10%/2-4mm), Amph. (1%/1-2mm), Bt. (1-2%/1-2mm) and Qtz. (1-2%/2mm) phenocrysts; manganese, iron and biological crust; debris/sheet (?).

Samples at: GeoZentrum Nordbayern

POS512-03ROV02-09



Locality description: Volcano 1, SW flank
 Lat.: 37°38,313'N
 Long.: 23°17,234'E
 Depth [m]: 235
 Date/Time [UTC]: 27.04.17/13:44

Sample description: One larger dense sample (dacitic) with fine grey matrix and some enclaves; porphyritic with Plag. (10-12%/2-5mm), Amph (1%/1-2mm) and Bt. (3%/2-3mm) phenocrysts; iron crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-03ROV02-10



Locality description: Volcano 1, SW flank
 Lat.: 37°38,228'N
 Long.: 23°17,225'E
 Depth [m]: 231
 Date/Time [UTC]: 27.04.17/13:56

Sample description: One smaller less dense sample (dacitic), fresh to slightly altered with fine matrix; porphyritic with Plag. (5-8%/2-4mm), Amph (8%/<1mm), Bt. (15%/1-2mm) and Qtz. (1-2%/<1mm) phenocrysts; about 8% angular (<1mm) vesicles; manganese, iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-03ROV02-11



Locality description: Volcano 1, SW flank
 Lat.: 37°38,332'N
 Long.: 23°17,230'E
 Depth [m]: 277?
 Date/Time [UTC]: 04.27.17/14:09

Sample description: One angular dense sample (dacitic) with fine grey matrix; porphyritic with Plag. (15%/2-4mm), Amph (2-3%/2-4mm) and Bt. (2-3%/2mm) phenocrysts; manganese, iron and biological crust; debris/sheet (?).

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-01



Locality description: Volcano 2, S flank
 Lat.: 37°37,851'N
 Long.: 23°18,288'E
 Depth [m]: 246
 Date/Time [UTC]: 28.04.17/06:13

Sample description: One sub-rounded sample (basaltic) with fine to glassy matrix; aphanitic to porphyritic with Ol. (3%/1-2mm), Px. (8%/1-2mm) and Amph phenocrysts; about 2-3% elongated (1-4mm) vesicles distributed in a degassing structure; iron and biological crust; debris/pillow (?).

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-02



Locality description: Volcano 2, S flank
 Lat.: 37°37,862'
 Long.: 23°18,301'
 Depth [m]: 243
 Date/Time [UTC]: 04.28.17/06:20

Sample description: One sub-rounded sample (basaltic) with fine to glassy matrix; aphanitic to porphyritic with Ol. (3%/<1mm) and Px. (5%/<1mm) phenocrysts; about 5% elongated to angular (1-4mm) layered vesicles; manganese, iron and biological crust; debris/pillow (?).

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-03



Locality description: Volcano 2, S flank
 Lat.: 37°37,911'N
 Long.: 23°18,340'E
 Depth [m]: 219
 Date/Time [UTC]: 28.04.17/06:34

Sample description: One small sample (basaltic) with fine dark matrix; porphyritic with Plag. (1%/<1mm), Ol. (3%/<1mm) and Px. (1%/0.5-1.5mm) phenocrysts; about 10% round to elongated (<5mm) vesicles; manganese and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-04



Locality description: Volcano 2, S flank
 Lat.: 37°37,924'N
 Long.: 23°18,367'E
 Depth [m]: 204
 Date/Time [UTC]: 28.04.17/06:46

Sample description: One small sample (basaltic) with fine dark matrix; aphanitic to porphyritic with Plag. (3%/<0.5mm), Ol. (1%/<0.5mm) and Amph (10%/1-3mm) phenocrysts; about 10% elongated (1.5cm) vesicles; manganese and biological crust; pillow (?).

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-05

Locality description: Volcano 2, S flank
 Lat.: 37°37,952'N
 Long.: 23°18,418'E
 Depth [m]: 203
 Date/Time [UTC]: 28.04.17/06:57

Sample description: One big dark sample (basaltic-andesitic) with fine matrix; porphyritic with Plag. (8%/<2mm), cpx. (1%/<1mm) and Qtz. (1%/<1.5mm) phenocrysts; about 4% round to elongated (<3mm) vesicles; manganese, iron and biological crust; sheet/block.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-06

Locality description: Volcano 2, S flank
 Lat.: 37°37,962'N
 Long.: 23°18,428'E
 Depth [m]: 193
 Date/Time [UTC]: 28.04.17/07:10

Sample description: One big relatively dark sample (basaltic-andesitic) with fine dark matrix; porphyritic with Plag. (10%/<4mm), Px. (1%/<0.5mm), Amph (1%/0.5-1mm) and Qtz. (1-2%/<1mm) phenocrysts; iron and biological crust; sheet/block.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-07

Locality description: Volcano 2, S flank
 Lat.: 37°37,987'N
 Long.: 23°18,462'E
 Depth [m]: 185
 Date/Time [UTC]: 28.04.17/07:24

Sample description: One big sample (andesitic) with fine matrix; porphyritic with Plag. (20%/<5mm), Amph (1%/<0.5mm) and Amph

(1%/<0.5mm) and Qtz. (1%/<0.5mm) phenocrysts; manganese, iron and biological crust; debris/sheet.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-08



Locality description: Volcano 2, S flank
 Lat.: 37°38,012'N
 Long.: 23°18,425'E
 Depth [m]: 181
 Date/Time [UTC]: 28.04.17/07:44

Sample description: One small flat sample (basaltic-andesitic) with fine dark matrix; porphyritic with Plag. (8%/<3mm) mostly smaller than 1.5mm and Amph (2-3%/<1mm) phenocrysts; manganese and biological crust; sheet/block.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-09



Locality description: Volcano 2, S flank
 Lat.: 37°38,027'N
 Long.: 23°18,408'E
 Depth [m]: 180
 Date/Time [UTC]: 28.04.17/08:01

Sample description: One very large sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag. (12%/2-4mm), Amph (5%/<3mm) and Qtz. (3%/2-3mm) phenocrysts; about 4% high sphericity and angular (<1mm) vesicles; manganese, iron, carbonatic and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-10



Locality description: Volcano 2, S flank
 Lat.: 37°38,046'N
 Long.: 23°18,392'E
 Depth [m]: 175
 Date/Time [UTC]: 28.04.17/08:17

Sample description: One conic dense sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag. (18%/2-4mm), Amph (3%/<1mm) and Qtz. (5%/2-3mm) phenocrysts; manganese, iron, carbonatic, clay and biological crust; debris/sheet (?).

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-11



Locality description: Volcano 2, S flank
 Lat.: 37°38,067'N
 Long.: 23°18,446'E
 Depth [m]: 161
 Date/Time [UTC]: 28.04.17/08:54

Sample description: One dense angular sample (andesitic), slightly altered with fine grey matrix; porphyritic with Plag. (8%/2-4mm), Amph (4%/2-3mm) and Bt. phenocrysts; iron, carbonatic and biological crust; debris/sheet (?).

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-12



Locality description: Volcano 2, S flank
 Lat.: 37°38,110'N
 Long.: 23°18,475'E
 Depth [m]: 169
 Date/Time [UTC]: 28.04.17/09:06

Sample description: One conic dense sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag. (8%/1-4mm), Amph (10%/<1mm), Bt. (2%/1-2mm) and Qtz. (3-5%/<2mm) phenocrysts; manganese, carbonatic and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-13



Locality description: Volcano 2, S flank
 Lat.: 37°38,151'N
 Long.: 23°18,501'E
 Depth [m]: 155
 Date/Time [UTC]: 28.04.17/09:18

Sample description: One dense conic sample (basaltic-andesitic) with fine matrix; porphyritic with Plag (10%/3-5mm), Amph (2-3%/<2mm) and Qtz (3-5%/2-4mm) phenocrysts; manganese, iron, carbonatic and biological crust; debris/sheet.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-14



Locality description: Volcano 2, S flank
 Lat.: 37°38,148'N
 Long.: 23°18,524'E
 Depth [m]: 139
 Date/Time [UTC]: 28.04.17/09:36

Sample description: One large dense sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag (8%/2-4mm), Amph (2%/1-2mm) and Qtz (3%/<3mm) phenocrysts; iron, carbonate and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-05ROV03-15



Locality description: Volcano 2, S flank
 Lat.: 37°38,179'N
 Long.: 23°18,553'E
 Depth [m]: 180

Date/Time [UTC]: 28.04.17/09:52

Sample description: One plate-shaped sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag (10%/2-4mm), Amph (3%/1-2mm) and Qtz (5%/2-4mm) phenocrysts; manganese, iron, carbonatic and biological crust; sheet.

Samples at: GeoZentrum Nordbayern

POS512-06ROV04-01



Locality description: Volcano 2, N flank
 Lat.: 37°38,632'N
 Long.: 23°18,289'E
 Depth [m]: 287
 Date/Time [UTC]: 28.04.17/11:51

Sample description: One small angular sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag. (12%/2-4mm), Bt. (1-2%/2-3mm) and Qtz. (3-5%/<2mm) phenocrysts; about 5% angular (1-2mm) vesicles; iron and biological crust; debris/sheet.

Samples at: GeoZentrum Nordbayern

POS512-06ROV04-02A



Locality description: Volcano 2, N flank
 Lat.: 37°38,506'N
 Long.: 23°18,381'E
 Depth [m]: 241
 Date/Time [UTC]: 28.04.17/12:45

Sample description: One triangular shaped sample (basaltic-andesitic) with fine black matrix; porphyritic with Plag. (20%/2-4mm), Amph (3-5%/<1mm) and Qtz. (5%/<2mm) phenocrysts; about 2-3% high sphericity, angular(1-2mm) vesicles; biological crust; debris

Samples at: GeoZentrum Nordbayern

POS512-06ROV04-02B



Locality description: Volcano 2, N flank
 Lat.: 37°38,506'N
 Long.: 23°18,381'E
 Depth [m]: 241
 Date/Time [UTC]: 28.04.17/12:45

Sample description: One triangular shaped dense sample (basaltic-andesitic) with fine matrix; porphyritic with Plag. (10%/2-4mm), Amph (3%/1-2mm), Bt. (<1%/2mm) and Qtz. (3%/2-3mm) phenocrysts; iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-06ROV04-03

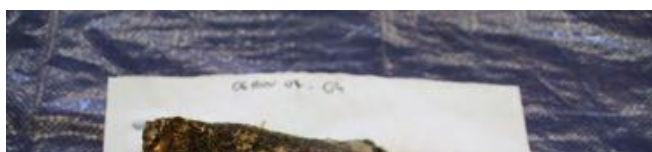


Locality description: Volcano 2, N flank
 Lat.: 37°38,475'N
 Long.: 23°18,406'E
 Depth [m]: 244
 Date/Time [UTC]: 28.04.17/13:04

Sample description: One angular dense sample (basaltic-andesitic) with fine matrix; porphyritic with Plag. (15%/2-4mm), Bt. (2-3%/1-2mm) and Qtz. (5%/2-3mm) phenocrysts; iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-06ROV04-04



Locality description: Volcano 2, N flank
 Lat.: 37°38,382'N
 Long.: 23°18,427'E
 Depth [m]: 258

Date/Time [UTC]: 28.04.17/13:19

Sample description: One big black sample (basaltic-andesitic) with fine matrix; porphyritic with Plag. (20%/2-6mm) phenocrysts; about 2% round (<1mm) vesicles; manganese and biological crust; sheet/block (?).

Samples at: GeoZentrum Nordbayern

POS512-06ROV04-05



Locality description: Volcano 2, N flank
 Lat.: 37°38,338'N
 Long.: 23°18,441'E
 Depth [m]: 239
 Date/Time [UTC]: 28.04.17/13:40

Sample description: One sample (basaltic-andesitic) with fine matrix; porphyritic with Plag. (20%/2-5mm) phenocrysts; about 3% elongated (<1cm) vesicles; manganese and biological crust; sheet/block (?).

Samples at: GeoZentrum Nordbayern

POS512-06ROV04-06



Locality description: Volcano 2, N flank
 Lat.: 37°38,307'N
 Long.: 23°18,445'E
 Depth [m]: 217
 Date/Time [UTC]: 28.04.17/13:57

Sample description: One big sample (andesitic), partially altered at the rim with fine matrix; porphyritic with Plag. (10%/<5mm), Amph (5%/<6mm) mostly <3mm and Qtz. (1-2%/<2mm) phenocrysts; about 5% round (<1.5mm) vesicles; manganese and biological crust, sheet/block.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-01



Locality description: Volcano 3 W flank
 Lat.: 37°37,714'N
 Long.: 23°18,369'E
 Depth [m]: 229
 Date/Time [UTC]: 29.04.17/09:59

Sample description: One small dense sample (andesitic) with fine greyish matrix; porphyritic with Plag. (10%/2-4mm) and Amph (3%/2-4mm) phenocrysts; iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-02



Locality description: Pausanias 3 W-Flank
 Lat.: 37°37,695'N
 Long.: 23°18,329'E
 Depth [m]: 201
 Date/Time [UTC]: 29.04.17/10:08

Sample description: One dense angular sample (andesitic), slightly altered with fine matrix; porphyritic with Plag. (8%/2-3mm), Amph (3-5%/2-3mm) and Qtz. (2%/2-5mm) phenocrysts; iron and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-03



Locality description: Volcano 3 W flank
 Lat.: 37°37,644'N
 Long.: 23°18,408'E
 Depth [m]: 172
 Date/Time [UTC]: 29.04.17/10:51

Sample description: One red sample (?volcanic?) strongly altered with fine altered red matrix; porphyritic with Plag. (15%/2-4mm), Amph (3%/2-3mm) and Qtz. (5%/2-3mm) phenocrysts; biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-04A



Locality description: Volcano 3 W flank
 Lat.: 37°37,612'N
 Long.: 23°18,415'E
 Depth [m]: 142
 Date/Time [UTC]: 29.04.17/11:26

Sample description:red algal carbonatic crust with serpulids, mussels and sponges.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-4B



Locality description: Volcano 3 W flank
 Lat.: 37°37,612'N
 Long.: 23°18,415'E
 Depth [m]: 142
 Date/Time [UTC]: 29.04.17/11:26

Sample description: One dense sample (andesitic) with fine greyish matrix; porphyritic with plag (5%/2-4mm) and amph (3%/1-2mm) phenocrysts; manganese, iron, clay and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-05

Locality description: Volcano 3 W flank
 Lat.: 37°37,556'N
 Long.: 23°18,429'E
 Depth [m]: 123
 Date/Time [UTC]: 29.04.17/12:15

Sample description: pieces of algal carbonate with serpulids, mussels, sponges and bryozoan.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-06A

Locality description: Volcano 3 W flank
 Lat.: 37°37,544'N
 Long.: 23°18,414'E
 Depth [m]: 122
 Date/Time [UTC]: 29.04.17/12:24

Sample description: debris of red algal carbonate with mussels and serpulids.

Samples at: GeoZentrum Nordbayern

POS512-08ROV05-07

Locality description: Volcano 3 W flank
 Lat.: 37°37,439'N
 Long.: 23°18,337'E
 Depth [m]: 74
 Date/Time [UTC]: 29.04.17/13:45

Sample description: red algal carbonate, serpulids, mussels, bryozoans, sponges and corals.

Samples at: GeoZentrum Nordbayern

POS512-10ROV06-01



Locality description: Volcano 4
 Lat.: 37°37,474'N
 Long.: 23°17,690'E
 Depth [m]: 196
 Date/Time [UTC]: 30.04.17/06:04

Sample description: red algal carbonate, serpulids, brachiopods and clay; debris.

Samples at: GeoZentrum Nordbayern

POS512-10ROV06-02

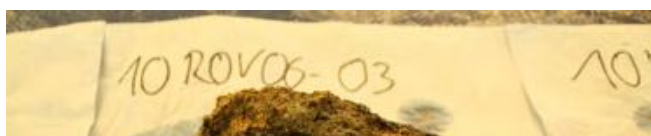


Locality description: Volcano 4
 Lat.: 37°37,472'N
 Long.: 23°17,735'E
 Depth [m]: 167
 Date/Time [UTC]: 30.04.17/06:17

Sample description: sponge

Samples at: -

POS512-10ROV06-03



Locality description: Volcano 4
 Lat.: 37°37,4172'N
 Long.: 23°17,8478'E

Depth [m]: 157
Date/Time [UTC]: 30.04.17/08:10

Sample description: One sample (andesitic), strongly altered at the rim with fine grey matrix; porphyritic with Plag. (10%/1-3mm), Amph (5%/1-3mm) and Bt. (2%/1-2mm) phenocrysts; about 10% sub-rounded (1-2mm) vesicles; carbonatic and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-10ROV06-04



Locality description: Volcano 4
Lat.: 37°37,413'N
Long.: 23°17,912'E
Depth [m]: 182
Date/Time [UTC]: 30.04.17/08:28

Sample description: One sample (andesitic), strongly altered at the rim with fine grey matrix; porphyritic with Plag. (10-15%/1-3mm), Amph (3%/1-2mm) and Qtz. (1%/<2mm) phenocrysts; about 7% round to elongated (1-2mm) vesicles; manganese and biological crust; debris

Samples at: GeoZentrum Nordbayern

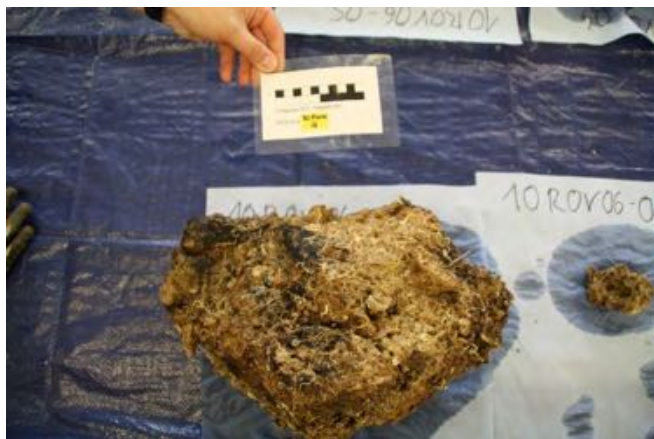
POS512-10ROV06-05



Locality description: Volcano 4
Lat.: 37°37,389'N
Long.: 23°18,001'E
Depth [m]: 154
Date/Time [UTC]: 30.04.17/08:56

Sample description: red algal carbonate with serpulids; debris.

Samples at: GeoZentrum Nordbayern

POS512-10ROV06-06

Locality description: Volcano 4
 Lat.: 37°37,391'N
 Long.: 23°17,029'E
 Depth [m]: 131
 Date/Time [UTC]: 30.04.17/09:17

Sample description: One large sample (andesitic) with fine grey matrix; porphyritic with plag (20%/2-4mm), amph (3%/3-4mm) and qtz (5%/<3mm) phenocrysts; about 3-5% angular (1-2mm) vesicles; manganese, iron, carbonate, sedimentary and biological crust; debris.

Samples at: GeoZentrum Nordbayern

POS512-10ROV06-07A

Locality description: Volcano 4
 Lat.: 37°37,376'N
 Long.: 23°18,077'E
 Depth [m]: 82
 Date/Time [UTC]: 30.04.30.17/09:54

Sample description: carbonate, red algae

Samples at: GeoZentrum Nordbayern

POS512-10ROV06-07B

Locality description: Volcano 4
 Lat.: 37°37,376'N
 Long.: 23°18,077'E
 Depth [m]: 82
 Date/Time [UTC]: 30.04.17/09:54

Sample description: carbonate, red algae

Samples at: GeoZentrum Nordbayern

POS512-10ROV06-08



Locality description: Volcano 4
 Lat.: 37°37,373'N
 Long.: 23°18,086'E
 Depth [m]: 85
 Date/Time [UTC]: 30.04.17/10:00

Sample description: carbonate, red algae

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-01



Locality description: Volcano 5 NW flank to top
 Lat.: 37°37,652'N
 Long.: 23°17,093'E
 Depth [m]: 276
 Date/Time [UTC]: 30.04.17/12:21

Sample description: carbonate

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-02A



Locality description: Volcano 5 NW flank to top
 Lat.: 37°37,636'N
 Long.: 23°17,092'E

Depth [m]: 267
Date/Time [UTC]: 30.04.17/12:30

Sample description: volcanoclastic breccia;
carbonate and biological crust.

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-02B



Locality description: Volcano 5 NW flank to top
Lat.: 37°37,636'N
Long.: 23°17,092'E
Depth [m]: 267
Date/Time [UTC]: 30.04.17/12:34

Sample description: carbonate

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-03



Locality description: Paphsanias 5 NW-flank to top
Lat.: 37°37,623'N
Long.: 23°17,098'E
Depth [m]: 256
Date/Time [UTC]: 30.04.17/12:40

Sample description: carbonate

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-04

Locality description: Volcano 5 NW flank to top
 Lat.: 37°37,620'N
 Long.: 23°17,092'E
 Depth [m]: 249
 Date/Time [UTC]: 30.04.17/12:55

Sample description: volcanoclastic breccia; carbonate and biological crust.

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-05

Locality description: Volcano 5 NW flank to top
 Lat.: 37°37,618'N
 Long.: 23°17,109'E
 Depth [m]: 230
 Date/Time [UTC]: 30.04.17/13:22

Sample description: volcanoclastic breccia with blockish lava fragments; carbonatic and biological crust.

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-06

Locality description: Volcano 5 NW flank to top
 Lat.: 37°37,562'N
 Long.: 23°17,134'E
 Depth [m]: 197
 Date/Time [UTC]: 30.04.17/13:42

Sample description: carbonate

Samples at: GeoZentrum Nordbayern

POS512-11ROV07-07



Locality description: Volcano 5 NW flank to top
 Lat.: 37°37,526'N
 Long.: 23°17,161'E
 Depth [m]: 188
 Date/Time [UTC]: 30.04.17/14:09

Sample description: carbonate

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-01

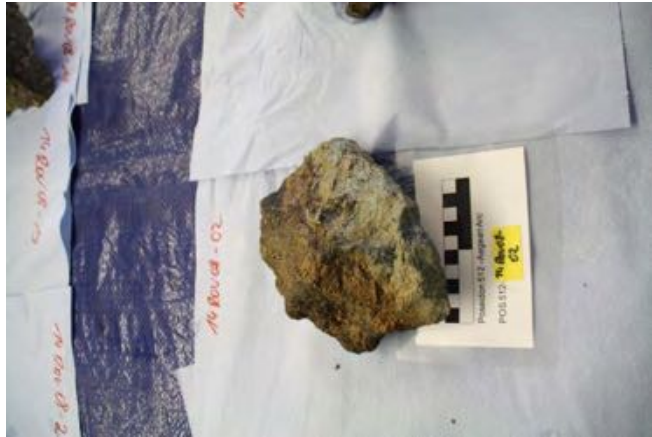


Locality description: Paphsanias volcanic field;
 Volcano 1 SW-flank
 Lat.: 37°38,140'N
 Long.: 23°16,668'E
 Depth [m]: 348
 Date/Time [UTC]: 01.05.17/07:41

Sample description: One dense sample (basaltic), slightly altered rim with fine matrix; porphyritic with plag (15%/<7mm) and ol (5%/<2mm) phenocrysts; carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-02



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,196'N

Long.: 23°16,746'E

Depth [m]: 327

Date/Time [UTC]: 01.05.17/08:04

Sample description: One sub-rounded sample (basaltic) with fine black matrix; porphyritic with plag (10%/2-3mm), amph (1%/1-2mm) and ol (8%/1-2mm) phenocrysts; about 15% angular and elongated (<1mm) vesicles; iron, sediment, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-03



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,205'N

Long.: 23°16,828'E

Depth [m]: 317

Date/Time [UTC]: 01.05.17/08:17

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (20%/<5mm) and amph (5%/<4mm) phenocrysts; about 5% elongated (<5mm) vesicles; carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-04



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,231'N

Long.: 23°16,851'E

Depth [m]: 307

Date/Time [UTC]: 01.05.17/08:30

Sample description: One sample (andesitic), slightly altered with fine matrix; microporphyritic with Plag. (10%/<1mm) phenocrysts; about 10% irregular (<1mm) vesicles; manganese and carbonatic crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-05



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,236'N

Long.: 23°16,888'E

Depth [m]: 309

Date/Time [UTC]: 01.05.17/08.42

Sample description: One dense angular sample (andesitic) with fine matrix; porphyritic with plag (5-8%/2-4mm), amph (2%/3-4mm) and bt (3%/1-2mm) phenocrysts; manganese, iron, sediment, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-06



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,222'N

Long.: 23°16,925'E

Depth [m]: 301

Date/Time [UTC]: 01.05.17/08.53

Sample description: One large sample (andesitic) with fine black matrix; porphyritic with plag (15%/2-4mm) and qtz (3-5%/<2mm) phenocrysts; about 5% elongated (2-9mm) vesicles; iron, sediment, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-07



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,288'N

Long.: 23°16,959'E

Depth [m]: 311

Date/Time [UTC]: 01.05.17/09:28

Sample description: One angular sample (andesitic) with fine matrix; porphyritic with plag (10%/<3mm) and amph (2-3%/2-6mm) phenocrysts; about 3-5% angular and partly elongated (1-3mm) vesicles; manganese, iron, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-08



Locality description: Paphsanias volcanic field; Volcano 1 SW-flank

Lat.: 37°38,287'N

Long.: 23°16,977'E

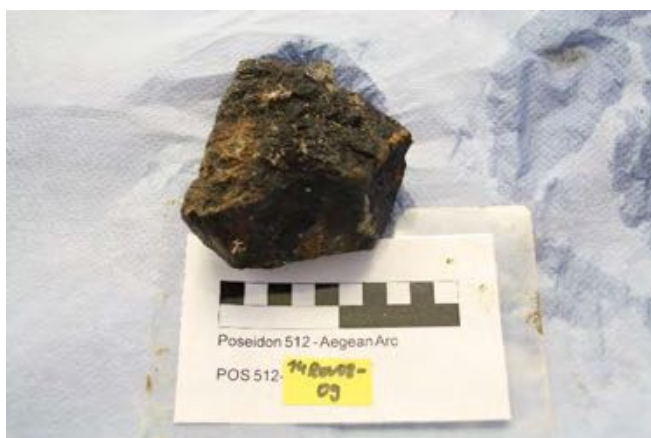
Depth [m]: 312

Date/Time [UTC]: 01.05.17/09:54

Sample description: One angular, elongated sample (andesitic) with fine grey matrix; porphyritic with Plag (15%/2-4mm), amph (3%/2-3mm) and Qtz (5%/<3mm) phenocrysts; about 3% angular (1-2mm) vesicles; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-09



Locality description: Paphsanias volcanic field; Volcano 1 SW-flank

Lat.: 37°38,293'N

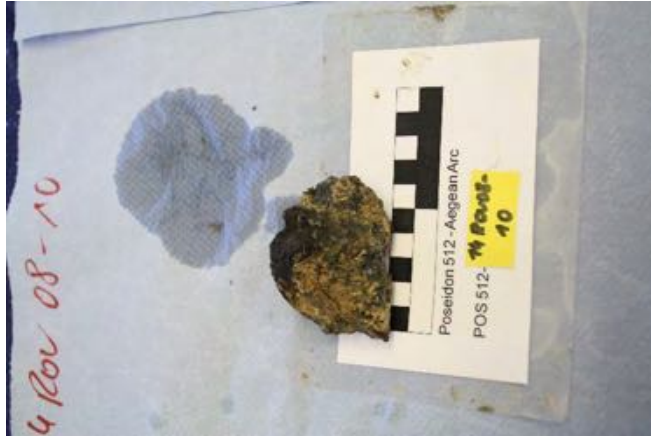
Long.: 23°17,006'E

Depth [m]: 303

Date/Time [UTC]: 01.05.17/10:09

Sample description: One small angular sample (andesitic) with fine matrix; porphyritic with plag (10%/2-4mm) amph (1-2%/2-3mm) and qtz (3%/3-4mm) phenocrysts; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-10

Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank
Lat.: 37°38,298'N
Long.: 23°17,030'E
Depth [m]: 297
Date/Time [UTC]: 01.05.17/10:19

Sample description: One small sample (andesitic) with fine matrix; porphyritic with plag (12%/2-4mm) and amph (2%/<1mm) phenocrysts; manganese, iron, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-11

Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank
Lat.: 37°38,323'N
Long.: 23°17,055'E
Depth [m]: 307
Date/Time [UTC]: 01.05.17/10:36

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (20%/<7mm) and amph (10%/<7mm) phenocrysts; about 10% irregular (<2mm) vesicles; iron and carbonate crust; block.

Samples at: GeoZentrum Nordbayern

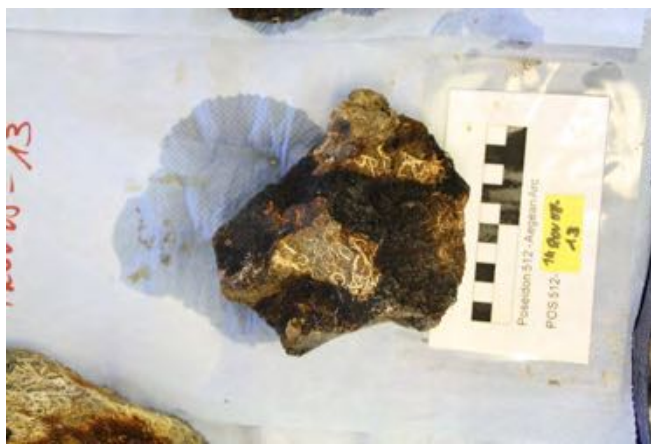
POS512-14ROV08-12

Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank
Lat.: 37°38,322'N
Long.: 23°17,097'E
Depth [m]: 296
Date/Time [UTC]: 01.05.17/10:53

Sample description: One sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (30%/<10mm) and amph (10%/<5mm) phenocrysts; about 10% irregular (<2mm) vesicles; manganese, iron, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-13



Locality description: Paphsanias volcanic field; Volcano 1 SW-flank

Lat.: 37°38,381'N

Long.: 23°17,095'E

Depth [m]: 293

Date/Time [UTC]: 01.05.17/11:16

Sample description: One sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (20%/<5mm) and amph (5%/<5mm) phenocrysts; about 5% elongated (<2mm) vesicles; manganese, iron, carbonatic and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-14



Locality description: Paphsanias volcanic field; Volcano 1 SW-flank

Lat.: 37°38,430'N

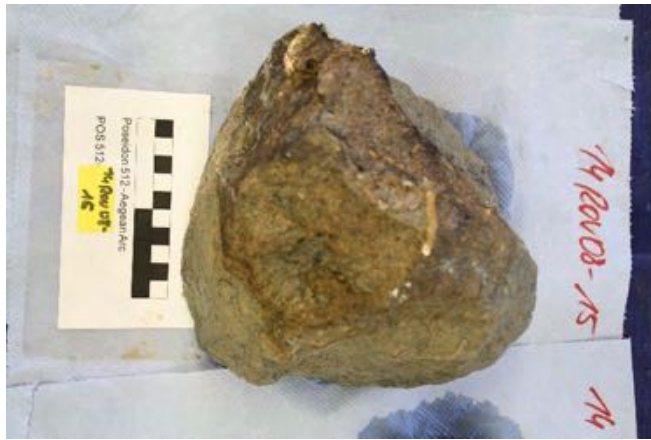
Long.: 23°17,064'E

Depth [m]: 293

Date/Time [UTC]: 01.05.17/11:33

Sample description: One sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (20%/<10mm), amph (5%/<5mm) and bt (5%/<5mm) phenocrysts; about 5% irregular (<2mm) vesicles; manganese, iron, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-15

Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,400'N

Long.: 23°16,973'E

Depth [m]: 298

Date/Time [UTC]: 01.05.17/11:55

Sample description: One sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (30%/<10mm), amph (5%/<5mm) and bt (5%/<5mm) phenocrysts; about 5% elongated (<2mm) vesicles; manganese, iron, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-16

Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,449'N

Long.: 23°16,970'E

Depth [m]: 272

Date/Time [UTC]: 01.05.17/12:14

Sample description: One layered sample (consolidated ash) with fine matrix; manganese, iron and carbonate crust.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-17

Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,471'N

Long.: 23°17,063'E

Depth [m]: 280

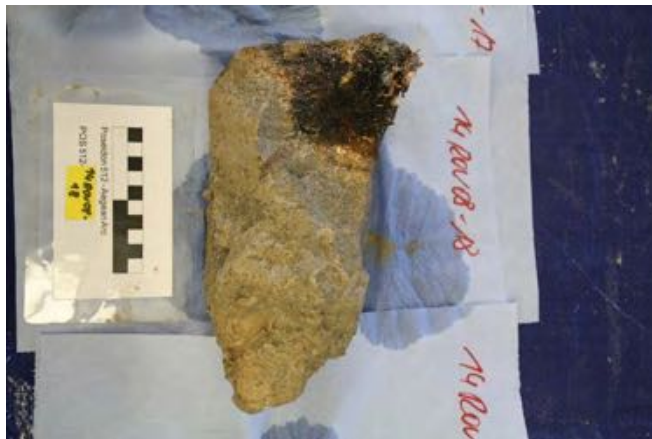
Date/Time [UTC]: 01.05.17/12:29

Sample description: One sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (20%/<10mm), amph (2%/<2mm) and bt (2%/<2mm) phenocrysts; manganese, iron,

carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-18



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,446'N

Long.: 23°17,140'E

Depth [m]: 248

Date/Time [UTC]: 01.05.17/13:02

Sample description: One dense angular sample (andesitic) with fine matrix; porphyritic with plag (15%/2-8mm), amph (3%/2-3mm) and bt (3%/2-3mm) phenocrysts; iron, sediment, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-19



Locality description: Paphsanias volcanic field;
Volcano 1 SW-flank

Lat.: 37°38,422'N

Long.: 23°17,283'E

Depth [m]: 254

Date/Time [UTC]: 01.05.17/13:28

Sample description: One angular sample (andesitic) with fine matrix; porphyritic with plag (20%/3-5mm), amph (5%/3-4mm) and bt (3%/<3mm) phenocrysts; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-14ROV08-20



Locality description: Paphsanias volcanic field; Volcano 1 SW-flank

Lat.: 37°38,439'N

Long.: 23°17,310'E

Depth [m]: 240

Date/Time [UTC]: 01.05.17/13:42

Sample description: One dense angular sample (andesitic) with fine matrix; porphyritic with plag (20%/2-14mm), amph (5%/2-3mm) and bt (8%/2-3mm) phenocrysts; about 5% angular (<2mm) vesicles; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-01



Locality description: Volcano 6

Lat.: 37°37,240'N

Long.: 23°16,680'E

Depth [m]: 333

Date/Time [UTC]: 02.05.17/06:06

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-02



Locality description: Volcano 6

Lat.: 37°37,238'N

Long.: 23°16,694'E

Depth [m]: 318

Date/Time [UTC]: 02.05.17/06:24

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-03

Locality description: Volcano 6
 Lat.: 37°37,250'N
 Long.: 23°16,713'E
 Depth [m]: 293
 Date/Time [UTC]: 02.05.17/06:39

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-05

Locality description: Volcano 6
 Lat.: 37°37,272'N
 Long.: 23°16,731'E
 Depth [m]: 269
 Date/Time [UTC]: 02.05.17/07:23

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-06

Locality description: Volcano 6
 Lat.: 37°37,282'N
 Long.: 23°16,762'E
 Depth [m]: 242
 Date/Time [UTC]: 02.05.17/07:41

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-07



Locality description: Volcano 6
 Lat.: 37°37,289'N
 Long.: 23°16,773'E
 Depth [m]: 234
 Date/Time [UTC]: 02.05.02.17/07:55

Sample description: One rounded sample (basaltic) with fine matrix; aphanitic to porphyritic with ol (2-3%/<1mm) and cpx. (5%/2-3%) phenocrysts; about 10% rounded (2-5mm) vesicles; iron, sediment, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-08



Locality description: Paphsanias 6
 Lat.: 37°37,301'N
 Long.: 23°16,800'E
 Depth [m]: 225
 Date/Time [UTC]: 02.05.17/08:08

Sample description: One rounded sample (basaltic) with fine matrix; aphanitic to porphyritic with plag (1-2%/2-3mm) and ol (1%/1-2mm) phenocrysts; about 2-3% rounded (1-2mm) vesicles; iron, sediment, carbonate and biological crust; pillow/block.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-09



Locality description: Volcano 6
 Lat.: 37°37,308'N
 Long.: 23°16,839'E
 Depth [m]: 213
 Date/Time [UTC]: 02.05.17/08:53

Sample description: One rounded sample (basaltic) with fine matrix; aphanitic with plag (2%/<2mm) and ol (1%/1-2mm) phenocrysts; about 5% elongated (2-3mm) vesicles; manganese, iron, sediment, carbonate and biological crust; pillow (?).

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-10



Locality description: Volcano 6
 Lat.: 37°37,328'N
 Long.: 23°16,846'E
 Depth [m]: 213
 Date/Time [UTC]: 02.05.17/09:04

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-16ROV09-11



Locality description: Volcano 6
 Lat.: 37°37,343'N
 Long.: 23°16,846'E
 Depth [m]: 227
 Date/Time [UTC]: 02.05.17/09:20

Sample description: One small sub-rounded sample (volcanoclastic breccia) with fine matrix; porphyritic with plag (5-10%/2-3mm) and ol (3%/1-2mm) phenocrysts; about 3% sub-rounded (2-3mm) vesicles; iron, carbonate and biological crust; breccia.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-01A



Locality description: steep cliff, near Methana

Lat.: 37°37,085'N

Long.: 23°17,393'E

Depth [m]: 299

Date/Time [UTC]: 02.05.17/11:19

Sample description: carbonate with clay layers and manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-01B



Locality description: steep cliff, near Methana

Lat.: 37°37,085'N

Long.: 23°17,393'E

Depth [m]: 299

Date/Time [UTC]: 02.05.17/11:19

Sample description: carbonate with clay lenses and manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-02



Locality description: steep cliff, near Methana

Lat.: 37°37,075'N

Long.: 23°17,403'E

Depth [m]: 278

Date/Time [UTC]: 02.05.17/11:42

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-03



Locality description: steep cliff, near Methana
 Lat.: 37°37,074'N
 Long.: 23°17,406'E
 Depth [m]: 275
 Date/Time [UTC]: 02.05.17/12:04

Sample description: carbonate with very fine layers.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-04



Locality description: steep cliff, near Methana
 Lat.: 37°37,073`
 Long.: 23°17,413`
 Depth [m]: 248
 Date/Time [UTC]: 05.02.17/12:25

Sample description: manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-05A



Locality description: steep cliff, near Methana
 Lat.: 37°37,7405'
 Long.: 23°17,4149'
 Depth [m]: 249
 Date/Time [UTC]: 02.05.17/12:28

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-05B



Locality description: steep cliff, near Methana
 Lat.: 37°37,7513'
 Long.: 23°17,4120'
 Depth [m]: 249
 Date/Time [UTC]: 05.02.17/12:30

Sample description: carbonate plate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-06



Locality description: steep cliff, near Methana
 Lat.: 37°37,069'N
 Long.: 23°17,416'E
 Depth [m]: 239
 Date/Time [UTC]: 02.05.17/12:38

Sample description: carbonate.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-07

Locality description: steep cliff, near Methana
 Lat.: 37°37,068'N
 Long.: 23°17,418'E
 Depth [m]: 238
 Date/Time [UTC]: 02.05.17/12:46

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-08

Locality description: steep cliff, near Methana
 Lat.: 37°37,041'N
 Long.: 23°17,458'E
 Depth [m]: 232
 Date/Time [UTC]: 02.05.17/13:04

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-09A

Locality description: steep cliff, near Methana
 Lat.: 37°37,061'N
 Long.: 23°17,489'E
 Depth [m]: 248
 Date/Time [UTC]: 02.05.17/13:26

Sample description: plate of fine layered carbonate.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-09B



Locality description: steep cliff, near Methana
 Lat.: 37°37,061'N
 Long.: 23°17,489'E
 Depth [m]: 248
 Date/Time [UTC]: 02.05.17/13:28

Sample description: carbonate with large clay lenses.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-09C



Locality description: steep cliff, near Methana
 Lat.: 37°37,073'N
 Long.: 23°17,485'E
 Depth [m]: 249
 Date/Time [UTC]: 02.05.17/13:35

Sample description: carbonate.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-10



Locality description: steep cliff, near Methana
 Lat.: 37°37,059'N
 Long.: 23°17,499'E

Depth [m]: 238
Date/Time [UTC]: 02.05.17/13:45

Sample description: fine to medium grained carbonate.

Samples at: GeoZentrum Nordbayern

POS512-17ROV10-11



Locality description: steep cliff, near Methana
Lat.: 37°37,046'N
Long.: 23°17,532'E
Depth [m]: 179
Date/Time [UTC]: 02.05.17/14:10

Sample description: carbonate.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-01



Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,936'N
Long.: 23°17,499'E
Depth [m]: 297
Date/Time [UTC]: 03.05.17/11:06

Sample description: One sample (basaltic) with fine matrix; porphyritic to holocrystalline with plag (5%/<5mm) and ol (1%/<1mm) phenocrysts; about 15% elongated (<1cm) vesicles; manganese, iron and sediment crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-02

Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,905'N
Long.: 23°17,476'E
Depth [m]: 283
Date/Time [UTC]: 03.05.17/11:16

Sample description: One rounded sample (basaltic) with fine matrix; porphyritic with plag (5%/2-3mm), bt (1-2%/1-2mm) and cpx (2%/<3mm) phenocrysts; about 25-30% rounded (1-5mm) vesicles; iron, sediment and biological crust; bomb.

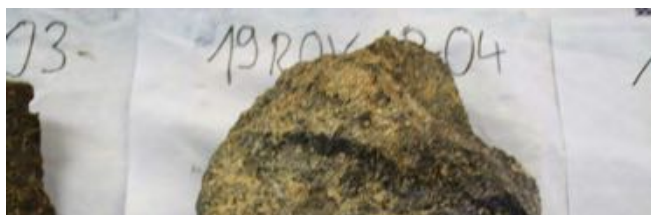
Samples at: GeoZentrum Nordbayern

POS512-19ROV11-03

Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,875'N
Long.: 23°17,485'E
Depth [m]: 278
Date/Time [UTC]: 03.05.17/11:29

Sample description: One angular sample (basaltic) with fine matrix; porphyritic with plag (8%/1-2mm) and qtz (2%/<2mm) phenocrysts; iron, sediment, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-04

Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,830'N
Long.: 23°17,481'E
Depth [m]: 267
Date/Time [UTC]: 03.05.17/11:41

	<p>Sample description: One dense angular sample (basaltic-andesitic) with fine matrix; porphyritic with plag (22%/2-5mm) and bt (8%/1-4mm) phenocrysts; iron, sediment and biological crust; block.</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-19ROV11-05</p>	
	<p>Locality description: Paphsanias volcanic field; Volcano 1 NW-flank Lat.: 37°38,799'N Long.: 23°17,466'E Depth [m]: 251 Date/Time [UTC]: 03.05.17/12:06</p> <p>Sample description: One small angular sample (basaltic) with fine black matrix; porphyritic with plag (2%/2-3mm), bt (3%/1-2mm) and ol (2%/1-2mm) phenocrysts; manganese, iron and biological crust; block.</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-19ROV11-06</p>	
	<p>Locality description: Paphsanias volcanic field; Volcano 1 NW-flank Lat.: 37°38,738'N Long.: 23°17,468'E Depth [m]: 257 Date/Time [UTC]: 03.05.17/12:20</p> <p>Sample description: One angular elongated sample (andesitic) with fine matrix; porphyritic with plag (12%/2-4mm), bt (5%/1-2mm) and qtz (3%/2-3mm) phenocrysts; manganese, iron, sediment and biological crust; block.</p> <p>Samples at: GeoZentrum Nordbayern</p>
<p>POS512-19ROV11-07</p>	



Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank

Lat.: 37°38,713'N

Long.: 23°17,458'E

Depth [m]: 247

Date/Time [UTC]: 03.05.17/12:34

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (20%/1-3mm) and amph (5%/<3mm) phenocrysts; about 2-3% sub-rounded (1-2mm) vesicles; manganese and biological crust; block.

Samples at: GeoZentrum Nordbayern

PO512-19ROV11-08



Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank

Lat.: 37°38,676'N

Long.: 23°17,452'E

Depth [m]: 250

Date/Time [UTC]: 03.05.17/12:53

Sample description: One sample (dacitic) with fine matrix; porphyritic to holocrystalline with plag (20%/<10mm), amph (5%/<5mm) and bt (5%/<5mm) phenocrysts; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

PO512-19ROV11-09



Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank

Lat.: 37°38,639'N

Long.: 23°17,447'E

Depth [m]: 250

Date/Time [UTC]: 03.05.17/13:04

Sample description: One dense sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (20%/<10mm), amph (5%/<7mm) and bt (5%/<7mm) phenocrysts; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-10



Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,606'N
Long.: 23°17,470'E
Depth [m]: 266
Date/Time [UTC]: 03.05.17/13:25

Sample description: One dense angular sample (andesitic) with fine matrix; porphyritic with plag (30%/2-5mm), bt (8%/2-4mm) and qtz (3%/2-3mm) phenocrysts; iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-11



Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,589'N
Long.: 23°17,492'E
Depth [m]: 263
Date/Time [UTC]: 03.05.17/13:38

Sample description: One angular elongated sample (andesitic) with fine grey matrix; porphyritic with plag (12%/2-4mm) and bt (8%/2-4mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-12A



Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,552'N
Long.: 23°17,494'E
Depth [m]: 240

Date/Time [UTC]: 03.05.17/13:57

Sample description: One dense sample (dacitic) with fine matrix; porphyritic with plag (30%/<8mm), amph (5%/<8mm) and bt (5%/<5mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-12B



Locality description: Paphsanias volcanic field; Volcano 1 NW-flank

Lat.: 37°38,552'N

Long.: 23°17,494'E

Depth [m]: 240

Date/Time [UTC]: 03.05.17/13:58

Sample description: One dense sample (dacitic) with fine matrix; porphyritic to holocrystalline with plag (20%/<6mm), amph (5%/<5mm) and bt (5%/<5mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-13A



Locality description: Paphsanias volcanic field; Volcano 1 NW-flank

Lat.: 37°38,530'N

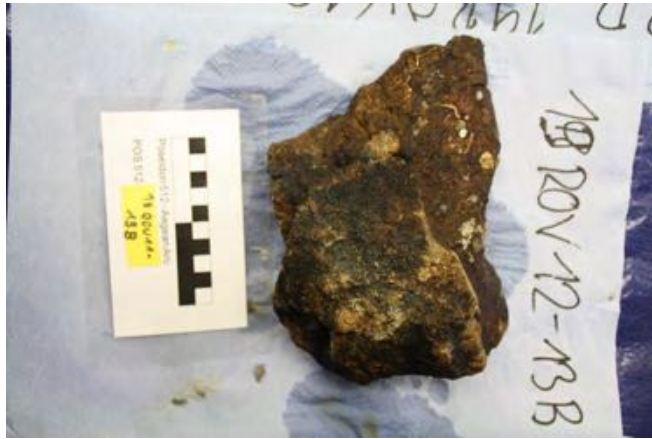
Long.: 23°17,496'E

Depth [m]: 246

Date/Time [UTC]: 03.05.17/14:05

Sample description: One dense sample (dacitic) with fine matrix; porphyritic to holocrystalline with plag (30%/<6mm), amph (5%/<5mm) and bt (5%/<5mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-19ROV11-13B

Locality description: Paphsanias volcanic field;
Volcano 1 NW-flank
Lat.: 37°38,530'N
Long.: 23°17,496'E
Depth [m]: 246
Date/Time [UTC]: 03.05.17/14:08

Sample description: One dense sample (dacitic) with fine matrix; porphyritic with plag (30%/<6mm), amph (5%/<5mm) and bt (5%/<5mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-01

Locality description: Paphsanias volcanic field;
Volcano 2 SE-flank
Lat.: 37°37,828'N
Long.: 23°18,449'E
Depth [m]: 213
Date/Time [UTC]: 04.05.17/06:17

Sample description: One sample (basaltic) with fine matrix; porphyritic to holocrystalline with plag (10%/<5mm) and ol (5%/<5mm) phenocrysts; about 10% elongated (<1cm) filled vesicles; manganese, iron, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-02

Locality description: Paphsanias volcanic field;
Volcano 2 SE flank
Lat.: 37°37,85'N
Long.: 23°18,468'E
Depth [m]: 206
Date/Time [UTC]: 04.05.17/06:53

Sample description: One sample (basaltic) with fine matrix; porphyritic with plag (10%/<6mm) and ol (5%/<3mm) phenocrysts; about 10% elongated (<1.5cm) vesicles; manganese, iron, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-03A



Locality description: Paphsaniyas volcanic field; Volcano 2 SE flank
 Lat.: 37°37,899'N
 Long.: 23°18,490'E
 Depth [m]: 214
 Date/Time [UTC]: 04.05.17/07:12

Sample description: One small sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (10%/<10mm) and amph (2%/<3mm) phenocrysts; about 5% elongated (<5mm) vesicles; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-03B

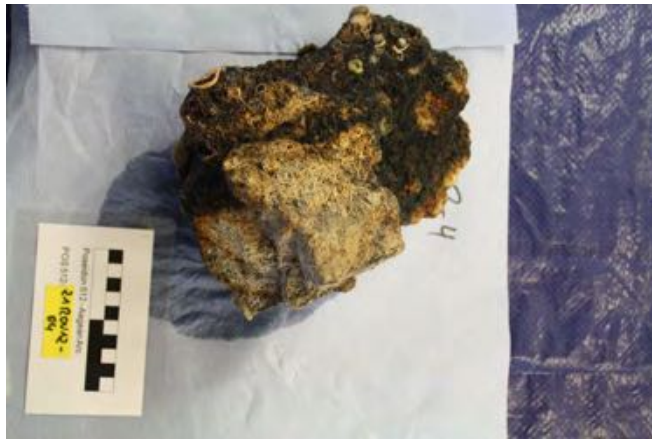


Locality description: Paphsaniyas volcanic field; Volcano 2 SE flank
 Lat.: 37°37,899'N
 Long.: 23°18,490'E
 Depth [m]: 214
 Date/Time [UTC]: 04.05.17/07:12

Sample description: One dense sample (andesitic) with fine matrix; porphyritic to holocrystalline with plag (10%/<6mm) and amph (5%/<2mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-04



Locality description: Paphsanias volcanic field;
Volcano 2 SE flank

Lat.: 37°37,900'N

Long.: 23°18,485'E

Depth [m]: 213

Date/Time [UTC]: 04.05.17/07:18

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (10%/<6mm) phenocrysts; about 10% elongated (<5mm) vesicles; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-05



Locality description: Paphsanias volcanic field;
Volcano 2 SE flank

Lat.: 37°37,923'N

Long.: 23°18,506'E

Depth [m]: 220

Date/Time [UTC]: 04.05.17/07:36

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (15%/<6mm) and amph (5%/<2mm) phenocrysts; up to 5% elongated (<10mm) vesicles; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-06



Locality description: Paphsanias volcanic field;
Volcano 2 SE flank

Lat.: 37°37,937'N

Long.: 23°18,499'E

Depth [m]: 210

Date/Time [UTC]: 04.05.17/07:47

Sample description: One elongated angular sample (andesitic) with fine matrix; porphyritic with plag (10-15%/2-4mm) and bt (3%/2-3mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-07



Locality description: Paphsanias volcanic field;
Volcano 2 SE flank
Lat.: 37°37,950'N
Long.: 23°18,506'E
Depth [m]: 202
Date/Time [UTC]: 04.05.17/07:58

Sample description: One angular sample (andesitic) with fine matrix; porphyritic with plag (10%/1-4mm) phenocrysts; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-08



Locality description: Paphsanias volcanic field;
Volcano 2 SE flank
Lat.: 37°37,977'N
Long.: 23°18,513'E
Depth [m]: 193
Date/Time [UTC]: 04.05.17/08:08

Sample description: One small angular sample (andesitic) with fine matrix; porphyritic with plag (15%/1-4mm), amph (5%/1-2mm) and bt (2%/1-3mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-09



Locality description: Paphsanias volcanic field;
Volcano 2 SE flank
Lat.: 37°38,019'N
Long.: 23°18,528'E
Depth [m]: 180

Date/Time [UTC]: 04.05.17/08:31

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (10%/2-3mm) and bt (5%/1-2mm) phenocrysts; iron, sediment, carbonate and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-10

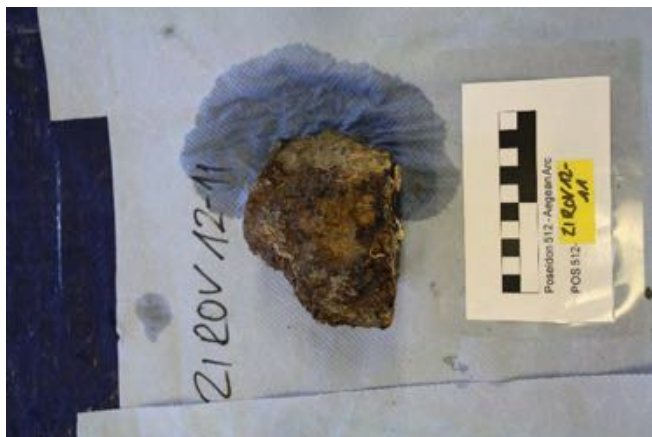


Locality description: Paphsanias volcanic field; Volcano 2 SE flank
 Lat.: 37°38,065'N
 Long.: 23°18,558E
 Depth [m]: 195
 Date/Time [UTC]: 04.05.17/08:46

Sample description: One elongated angular sample (andesitic) with fine matrix; porphyritic with plag (10%/2-6mm) and ol (5%/1-2mm) phenocrysts; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-11



Locality description: Paphsanias volcanic field; Volcano 2 SE flank
 Lat.: 37°38,070'N
 Long.: 23°18,561'E
 Depth [m]: 187
 Date/Time [UTC]: 04.05.17/08:55

Sample description: One small angular sample (andesitic) with fine matrix; porphyritic with plag (10%/2-3mm) phenocrysts; manganese, iron, sediment and biological crust; block.

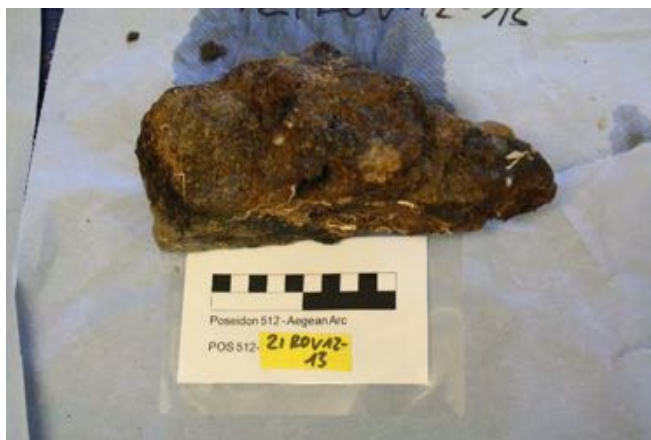
Samples at: GeoZentrum Nordbayern

POS512-21ROV12-12

Locality description: Paphsanias volcanic field;
Volcano 2 SE flank
Lat.: 37°38,099'N
Long.: 23°18,600'E
Depth [m]: 203
Date/Time [UTC]: 04.05.17/09:10

Sample description: One large angular sample (andesitic) with fine matrix; porphyritic with plag (20%/1-3mm) and bt (3%/1-2mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-13

Locality description: Paphsanias volcanic field;
Volcano 2 SE flank
Lat.: 37°38,125'N
Long.: 23°18,623'E
Depth [m]: 204
Date/Time [UTC]: 04.05.17/09:30

Sample description: One dark sample (basaltic) with fine matrix; porphyritic with plag (20-25%/<4mm) and amph (2%/<2mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-14

Locality description: Paphsanias volcanic field;
Volcano 2 SE flank
Lat.: 37°38,188'N
Long.: 23°18,630'E
Depth [m]: 210
Date/Time [UTC]: 04.05.17/09:45

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (20%/<5mm), amph (3%/<3mm) and bt (2%/<3mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-21ROV12-15



Locality description: Paphsanias volcanic field; Volcano 2 SE flank

Lat.: 37°38,242'N

Long.: 23°18,632'E

Depth [m]: 202

Date/Time [UTC]: 04.05.17/10:08

Sample description: One sample (andesitic) with fine matrix; porphyritic with plag (20%/1-5mm), amph (3%/<2mm) and qtz (1%/<1mm) phenocrysts; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-01



Locality description: Paphsanias volcanic field; Volcano 6 top

Lat.: 37°37,348'N

Long.: 23°16,833'E

Depth [m]: 236

Date/Time [UTC]: 04.05.17/12:33

Sample description: manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-02

Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,338'N
Long.: 23°16,831'E
Depth [m]: 229
Date/Time [UTC]: 04.05.17/12:39

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-03

Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,341'N
Long.: 23°16,838'E
Depth [m]: 228
Date/Time [UTC]: 04.05.17/12:48

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-04

Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,330'N
Long.: 23°16,838'E
Depth [m]: 218
Date/Time [UTC]: 04.05.17/12:59

Sample description: carbonate crust.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-05A



Locality description: Paphsaniyas volcanic field;
Volcano 6 top
Lat.: 37°37,320'N
Long.: 23°16,840'E
Depth [m]: 215
Date/Time [UTC]: 04.05.17/13:09

Sample description: One sub-rounded sample (with fine matrix; porphyritic with plag (2-3%/<1mm) and ol (1-2%/<1mm) phenocrysts; about 15% rounded (1-2mm) vesicles; manganese, iron, sediment and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-05B



Locality description: Paphsaniyas volcanic field;
Volcano 6 top
Lat.: 37°37,320'N
Long.: 23°16,840'E
Depth [m]: 215
Date/Time [UTC]: 04.05.17/13:09

Sample description: One sub-rounded sample (basaltic) with fine matrix; porphyritic with plag (3%/1-2mm), ol (2%/1-2mm) and cpx (1%/1-2mm) phenocrysts; about 40% angular (1-2mm) vesicles; manganese, iron and biological crust; block.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-05C



Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,320'N
Long.: 23°16,840'E
Depth [m]: 215
Date/Time [UTC]: 04.05.17/13:13

Sample description: One large sample (basaltic) with fine to glassy matrix; porphyritic to glassy with plag (2%/<1mm), ol (2%/<1mm) and cpx (2%/<1mm) phenocrysts; about 3% elongate (<3mm) vesicles; block.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-06



Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,309'N
Long.: 23°16,838'E
Depth [m]: 212
Date/Time [UTC]: 04.05.17/13:24

Sample description: One sample (volcanoclastic breccia) with possibly fresh and glassy lava fragments with fine matrix; block.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-07



Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,299'N
Long.: 23°16,838'E
Depth [m]: 229
Date/Time [UTC]: 04.05.17/12:39

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-08

Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,296'N
Long.: 23°16,830'E
Depth [m]: 213
Date/Time [UTC]: 04.05.17/13:43

Sample description: carbonate with manganese, red algae and brachiopods.

Samples at: GeoZentrum Nordbayern

POS512-22ROV13-09

Locality description: Paphsanias volcanic field;
Volcano 6 top
Lat.: 37°37,291'N
Long.: 23°16,836'E
Depth [m]: 213
Date/Time [UTC]: 04.05.17/13:50

Sample description: carbonate with manganese crust.

Samples at: GeoZentrum Nordbayern