

POS 511 Weekly Science Report (10/04/17 to 16/04/17)

Jörg Geldmacher and Scientific Party POS 511

During the second week of the expedition most scientific operations (except for the nightly multibeam mapping) were conducted inside the famous Santorini caldera, a 10 km x 6 km wide and 400 m deep collapse basin that is bounded by vertical cliffs up to 300 m above sea level. The caldera is a composite structure with its current shape resulting from at least four collapse events. The last collapse was triggered by the Minoan eruption (3600 years ago), one of the largest volcanic eruptions in historical time, that possibly contributed to the downfall of the Minoan civilization. The primary objective of this weeks work was to sample volcanic successions that pre-date any volcanic units that are exposed on land, to extend the temporal, volcanological and geochemical record of Santorini volcanism further back in time.



View from the ship towards the cliff at Cape Perivola (northern Thera) while operating with the ROV at 315 m water depths (despite the close proximity to the shore). The white houses on the cliff top are built on the tan-colored products of the famous Minoan eruption (Photo: J. Geldmacher).

During the first four days of this week we were joined by day guests (daily shuttled by a local motorboat from/to the nearby port of Thira) including our local cooperation partner Prof. P. Nomikou from the University of Athens and Mrs. K. Tagonidou from the Greek Ministry of Culture (Ephorate of Underwater Antiquities). Following a request from the Greek authorities, we spent half a day with surveying and photogrammetric mapping of an assumed archeological site with the ROV, particular focusing on its deeper surroundings. In the afternoon, a second survey was conducted at a known hydrothermal vent field located nearby.

Up to a few meters high mounds covered by bright yellowish bacterial mats were observed and, for the first time at this field, one chimney. The following four days were spent with ROV dives sampling the lower successions of the steep walls in the southern and northern part of the caldera including both sides of a narrow ridge that is assumed to represent a remnant of an older (pre-minoan) caldera wall. All these dives were highly successful, returning numerous, generally well-preserved volcanic rocks including many lavas, volcanic sandstone (containing fresh igneous minerals), and a possible submarine ignimbrite sample.



Master Student Phillip Kosbü (University of Kiel) replacing the wax filled cups mounted around the crusher plate of a wax corer. The corer is launched over the side of the ship on a wire and rammed into lava-covered sea floor. Small fragments of rock (e.g. volcanic glass) that break off of the lava flow on impact are trapped in the wax. (Photo: J. Geldmacher)

While the propellers of the ROV received urgently needed maintenance on April 15, we deployed the wax corer for the first time during this expedition near the Kameni Islands in the center of the caldera. The ancient geographer Strabo was the first to notice post-minoan volcanism in Santorini by describing the birth of a newly formed island in the middle of the caldera in 197 BC. Several following eruptive phases formed the two present Kameni Islands with the most recent eruption occurring in 1950. While previous work focused on studying the sub-aerial exposed Kameni lavas, no attempt has been made to sample the submarine extension of the islands. By encircling the two islands and taking lava (glass) samples with the wax corer from bathymetrically clearly distinct lava flows/lobes we hope to be able to correlate the submarine structures with subaerially exposed eruptive centers of known age.

In the week from April 10 to April 16 we have conducted 2 ROV survey dives, 8 ROV sampling dives, 22 wax corer deployments, 2 CTD stations (with water sampling) and executed an extensive nightly multibeam mapping program. All on board are well, enjoying the good weather and looking forward to the scientific discoveries of the upcoming (final) week.