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CMAS Scientific Diving Center

Comparative investigation of recent & paleontological, (semi-) aquatic ecosystems under volcanic-hydrothermal environmental conditions

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Sedimentology of active fluid escape structures in Panarea

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Generals

Volcanoes, hydrothermal systems and connected ecosystems are common worldwide. Each system is causing variable but highly specific geological, ecological and physico-chemical parameters.
The CMAS Scientific Diving Center at TU Freiberg is conducting research at such a system in Panarea, Italy, since 2006. The system of Panarea was chosen due to its characteristics as a recent, active extreme-ecosystem in a shallow marine environment. It comprises nine different diving locations in various water depths (8 – 40 m) and geological settings (Fig. 1).
Generally, a prediction of volcanic activity by synthesis of different research projects (e.g. geology, water- / gas- chemistry, heat flux measurement, etc.) shall be attempted. Therefore, a wide span of interdisciplinary topics is in focus of our investigations. In 2015, the working-group “Geology” dealt with the detail-investigation of unique sedimentary structures being caused by active fumarolic fluid emissions. Fieldwork, sampling and documentation were carried to prepare further (laboratory-) investigation in Germany.

Objectives

Characteristic and preservationable fluid escape structures had to be identified and sampled using different appropriate methods. Type and tools for sampling depended on the in-situ lithological properties of the rock. The results have to be combined with intensive detailed mapping and results of neighboring disciplines.

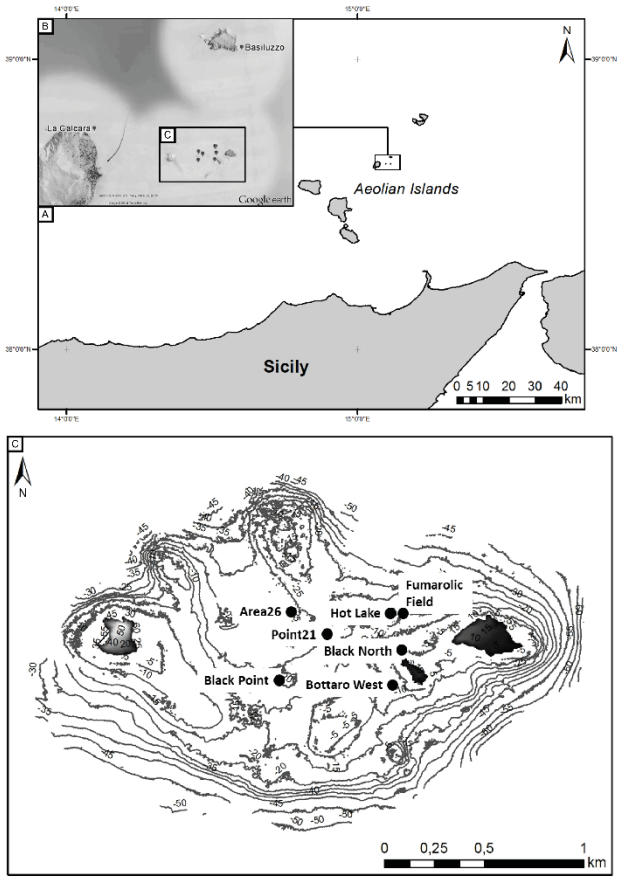

Fig. 1: Overview map on the area of investigation including the diving spots where samples were taken.

Methods

All geological work had to be carried out using methods of Scientific Diving. Due to the sediment cover of most of the points of interest, excavation work had to be carried out at first. This was realized using an airlift pump (Fig. 2), which came in to action as a completely redesigned version for the first time in 2015. Afterwards, the “cleaned” structures and rock surfaces were documented and samples were taken.

Fig. 2: Excavation of escape-structures at 26 m depth using the newly designed airlift-pump.

Results

The accomplished fieldwork affords the collection of various samples, being characteristic for the prevailing volcanic-hydrothermal system. At all, around 90 samples of different facies types were taken (examples shown in Fig. 3). They prove the correctness of former hypothesis in the context of the sedimentological development of fluid-escape-structures and their genesis. In the following, they will be investigated in different laboratories (e.g. XRF) and prepared for further structural analysis (polished and thin sections).

Acknowledgements

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Fig. 3: TOP – Massive sulphide ore mineralisation (?Marcasite) in La Calcara at 23 m depth. The minerals grew around active degassing structures. MIDDLE – Fluid-escape-structure in sandy facies at 26 m depth (Area 26). Lineament structures along major fault zones develop hinting on the pathways in the ground. BOTTOM – Fluid escape structure (tubes, type TFe) with iron-dominated mineral-precipitates from the location Basiluzzo (35 m depth).