Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.32028

Epithermal-style mineralisation at active shallow-submarine vents, Milos Island, Greece

FABIAN HAMPEL[1], MANUEL KEITH[1], KARSTEN M. HAASE[1], JAN J. FALKENBERG[2], MARCEL REGELOUS[1] AND HARALD STRAUSS[3]

[1]GeoZentrum Nordbayern, Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg, 91054 Erlangen, Germany
[2]Technische Universität Berlin, Institut für Angewandte Geowissenschaften, 10587 Berlin, Germany
[3]Universität Münster, Institut für Geologie und Paläontologie, 48149 Münster, Germany

Milos Island, located in the Hellenic Volcanic Arc in the Mediterranean Sea, is characterised by intense tectonic activity due to the subduction of the African Plate beneath the Aegean microplate. This leads to widespread shallow water hydrothermalism accompanied by extensive CO_2 degassing around the island. Various vent fields with barite- and As-Sb sulfide-rich chimney structures were discovered and sampled during RV Meteor cruise M192/2 at 100 to 800 m water depth, which occasionally reached several meters in height, emitting fluids with temperatures between 40 and 180 °C. The variable water depth of the vent sites around Milos Island thereby allows to study the transition from shallow to deeper hydrothermal venting and its effects on the related mineralisation processes.

Optical microscopy, SEM-EDX and XRD were used for imaging and mineral phase identification, showing that the mineralisation is dominated by barite, stibnite, realgar, orpiment, pyrite, metacinnabar, and varieties of Ag-rich sulfosalts, such as andorite, miargyrite, Ag-tetrahedrite, and diaphorite. Based on these mineralogical data, we combine whole rock geochemistry with sulfide and sulfate micro-analysis by EPMA and LA-ICP-MS. The geochemical data shows that the hydrothermal precipitates concentrate epithermal suite elements, such as As, Ag, Hg, Sb, and Tl. This suggests that the epithermal mineralisation known from Milos Island extends to shallow submarine environments, where potentially equivalent mineralisation processes can be studied at active hydrothermal vent sites. This study aims to determine the evolution of the hydrothermal vents around Milos Island to study possible changes in the fluid composition with water depth, and to identify and characterise the element and fluid sources by stable S and radiogenic Sr-Nd isotopes. We ultimately aim to decipher the processes leading to the hydrothermal fractionation and enrichment of epithermal suite elements at the transition from shallow to deeper hydrothermal venting and how these compare and connect with the on-shore epithermal mineralisation and ongoing geothermal activity on Milos Island.