EGU2020-11612
https://doi.org/10.5194/egusphere-egu2020-11612
EGU General Assembly 2020

Integrated regional scale view of Milos submarine hydrothermalism

Valentine Puzenat[1], **Jean-Emmanuel Martelat**[2], Javier Escartin[1], Thibaut Barreyre[3], Nuno Gracias[4], Guillem Vallicrosa[4], Rafael Garcia[4], Lluís Magí[4], Paraskevi Nomikou[5], Philippe Grandjean[2], Pascal Allemand[2], Anders Schouw[3], Sven Le Moine Bauer[3], Steffen Leth Jørgensen[3], Varvara Antoniou[5], Othonas Vlasopoulos[5], Paraskevi Polymenakou[6], Manolis Mandalakis[6], Omer Coskun[7], and William Orsi[7]

[1]Institut de Physique du Globe de Paris, Université de Paris, Paris, France
[2]Laboratoire de Géologie, Université de Lyon, Villeurbanne, France
[3]Department of Earth Science, University of Bergen, Bergen, Norway
[4]Underwater Robotics Research Center, Computer Vision and Robotics Institute, Universitat de Girona, Girona, Spain
[5]Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens, Athens, Greece
[6]Institute of Marine Biology Biotechnology and Aquaculture, Hellenic Centre for Marine Research, Heraklion-Crete, Greece
[7]Department of Earth and Environmental Sciences Palaeontology & Geobiology, Ludwig-Maximilians-University of Munich, München, Germany

Submarine hydrothermal activity is common at the flanks of volcanic islands, and in some cases, occurring at very shallow water (0-100 meter depth). These sites are a key target for systematic seafloor mapping to understand the location, geometry and nature of hydrothermal discharge. These data are also critical for monitoring the temporal variability of these dynamic systems, while providing a context for instrumental measurements, sampling and other observations (e.g., temperature of outflow, chemistry, etc.). Here we present a systematic mapping of the Milos hydrothermal system in the Hellenic volcanic Arc, characterized by submarine gas emissions, high-temperature outflow, bacterial mats, precipitation of hydrothermal minerals, and small hydrothermal constructs and edifices. We have mapped this site at regional scales using satellite imagery (World-View2 images from the DigitalGlobe foundation), complemented with aerial photography acquired with drones, and high-resolution seafloor photomosaics (<1 cm resolution) from underwater imagery acquired by the autonomous underwater vehicle Sparus II (University of Girona).

Our drone and AUV mapping ground truths the correlation between patterns in satellite imagery and hydrothermal outflow, associated to mineral precipitates and/or bacterial mats at the seafloor. This mapping also reveals a clear organization of the hydrothermal outflow in sandy areas. In particular, polygonal patterns are common and often associated with inactive or actively bubbling pockmarks. These areas, showing white bacterial mats and hydrothermal precipitates, are rippled, suggesting that the hydrothermal precipitates do not consolidate the sediment. White precipitates display subseafloor temperatures >50°C at depths of 10 to 50 cm. The white areas are bound by bands of seafloor with a hummocky structure due to intense bioturbation, that obliterates the ripples, with widths of up to a few meters. This area shows subseafloor

temperatures of 20-40°C, and corresponds to a transition from the high-temperature white zones and the seafloor with ripples and no hydrothermal precipitates. This area exhibits subseafloor temperatures similar to those of seawater, and can be associated with seagrass. These patterns reveal a clear organization of a narrowly focused hydrothermal outflow that controls the biological communities at the seafloor and subseafloor. We will discuss the implications of these observations to quantify hydrothermal fluxes in the study area.