Regional mapping of hydrothermal outflow along the SW coast of Milos

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Résumé

Milos volcanic island belongs to the Aegean volcanic arc. The Milos volcanism is developed during plio-quaternary transtensive tectonics. The volcanism extends over a contiental Mesozoic basement (blueschists). The island displays ground deformation, seismic activity, historical phreatic explosions and is the most important high-enthalpy geothermal field in Greece (Liakopoulos 1987; Fytikas 1989). The area contains indications of hydrothermal activity, including gas and liquid emissions (onshore: hot soils, altered soils, localized and pervasive alteration of economic interest, fumarolles; offshore: bubbling vents, cotton like bacterial mats and various precipitates). To characterize the subaerial and underwater near-shore hydrothermal circulations in space we used satellite images (World View – Pleiades) and aerial drone images. We work from Kalamos headland (Rhyolitic dome) to East-Paleochory bay, acquiring visible and infrared (IR) photomosaics. On the field we measured the T∘C using "Poseidon" instrument offshore (Puzenat et al., 2021), "FLIR" camera and manual thermometers onshore. Visible images reveal temperature proxies such as white hydrothermal patches (offshore), colored and discolored soils (onshore). IR images highlight the morphologies of T∘C anomalies, that correspond to diffuse, localized, elongated or circular.

The hydrothermal outflow have been correlated with geological features : fault-zone (150 m wide), fault-rocks (hydrothermal silicified breccia compatible with sudden fluid discharge), fractures. Thermal anomalies underlined different strike: either N-S (Zephyria graben orientation) or NW-SE until the Agia Kyriaki bay (Fyriplaka graben orientation). NE-SW orientations are also visible (Main Cycladic Lineament, see Leroy et al., 2023; Cavailhes et al., 2025). Our modern, multi-scale, multi-methods and integrated mapping defines an highly heterogeneous regional thermal scheme which is tectonically-controlled. Based on our oldest aerial images, the geometry of the hydrothermal system appears to have remained stable for the past 45 years.

Cavailhes et al., 2025 IAVCEI meeting Geneva.

Fytikas, 1989 Geothermics, 18(4), 611-621

Leroy et al., 2023 Journal of Structural Geology, 177, 104982

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Liakopoulos 1987 Thesis Universite Paris-6 accessible researchgate.net

Puzenat et al., 2021 Marine Geology, 438, 106521

Mots-Clés: Volcanic Island, Hydrothermalism, Fluid overpressure, Hydrothermal explosion