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The Azores fumarolic fields as an analog for Mars hydrothermal alteration

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Hydrothermal environments have long been presumed to exist on Mars based on orbital detections of hydrated minerals, terrestrial analogs studies, and Martian meteorites analyses. The first definitive evidence for volcanic hydrothermalism on Mars is the in situ detection of amorphous silica-rich outcrops (>90% wt opal-A) by the Mars Exploration Rover Spirit, which have been tentatively interpreted as either acid sulfate leaching in fumarolic environments or direct precipitation from hot springs. Such hydrothermal spots may have created suitable environments for life and should be a prime target in the search for biosignatures on Mars. The present project proposes to study alteration at the fumarolic fields of the Azorean islands, Portugal, as an analog to some early Martian environments. Volcanoes and lava flows in the Azores have basaltic to trachytic compositions, which are roughly similar to the Martian average crust composition. Three hydrothermal fumarolic fields emitting various gas species at the Furnas Volcano on the São Miguel Island and at the Pico Alto Volcano, on the Terceira Island, were visited in September 2017. Several vents, mudpots as well as relatively pristine bedrock were sampled for gases, biomaterials and rocks at each site. Specifically, characterization of the collected rock samples by VNIR spectroscopy, XRD and ICP analyses will allow us to discuss variation in mineralogical assemblages and alteration patterns as a function of the bedrock, fluid composition and temperature, among others. The present contribution is part of a bigger project of the MAFIC network (Mars Analogue Fumaroles Interdisciplinary Collaboration), which includes the joint study of microbial species within the Azores fumarolic environments.