

# Geological, mineralogical, and geochemical characterization of an inactive ultramafic-hosted seafloor massive sulfide (SMS) deposit: Example of the RTI Romanche (MAR).

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The new Romanche hydrothermal field discovered in 2019 (SMARTIES cruise) is located on an ultramafic substratum in a slow ridge context (Mid-Atlantic Ridge, MAR), adjacent to a peridotite dome that was formed by a currently inactive detachment fault. The hydrothermal field is inactive or weakly active (presence of microbial mats), partly collapsed and intersected by normal faults N120 and N20. Sulfide mineralization is dominated by iron sulfides and is characterized by low Cu and Zn concentrations ( $\text{Cu} + \text{Zn} < 3.5 \text{ wt.\%}$ ; n=17). Three mineralization stages can be defined according to their mineral assemblages: (1) The first is a high temperature phase characterized by pyrrhotite, Fe-rich sphalerite (10-19 wt.% Fe), isocubanite and chalcopyrite; (2) A second medium/high temperature phase is illustrated by pyrite, which can be subdivided according to morphology into microcrystalline 1<sup>st</sup> generation pyrite, massive 2<sup>nd</sup> generation pyrite and framboidal 3<sup>rd</sup> generation pyrite associated with barite; (3) A third stage, related to supergene alteration (e.g. halmyrolysis) affects the primary sulfides and allowed the formation of oxides, oxyhydroxides, hydroxychlorides, secondary sulphides and native metals. The over-refining process described by Hanington et al. (1998)<sup>1</sup> could explain the high concentrations of Fe and low contents of Zn and Cu compared to other ultramafic-hosted SMS deposits (ex. Rainbow, Logatchev, Ashadze).

Preliminary sulfur isotope study shows a remarkable large range of  $\delta^{34}\text{S}$  within and between sulfide deposits [-8.45 to +16.28‰] compared to previous studies of active vents along the MAR. We will discuss the different hypotheses explaining this variability.

<sup>1</sup> Hannington, Mark D., Galley, A.G., Herzog, Peter and Petersen, Sven (1998) *Comparison of the TAG mound and stockwork complex with Cyprus-type massive sulfide deposits*. Proceedings of the Ocean Drilling Program: Scientific Results, 158 . pp. 389-415. DOI 10.2973/odp.proc.sr.158.217.1998.