

## **OLD MASSIVE SULPHIDE DEPOSITS: LESSONS FROM THE MAR SOUTH OF THE AZORES AND FROM DEEP SEA DRILLING.**

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Venting of black smoke is not a very efficient process to produce large mineral deposits, as part of the metals is lost into the water column and oxidation destroys sulphides exposed on the sea floor. ODP drilling (TAG, Juan de Fuca) has shown that sub-surface sulphide precipitation is more efficient. Iberian Pyrite Belt data showed the same years ago. At Neves-Corvo there is widespread replacement of silicate rocks by sulphides. At Aljustrel there are millions of tonnes of ores similar to the TAG sulphide-after-anhydrite pseudo-breccias. The MAR South of the Azores contains hydrothermal fields in both neovolcanic (Lucky Strike and Menez Gwen) and ultramafic-dominated situations (Rainbow and Saldanha). Lucky Strike and Menez Gwen contain breccias of volcanic and sometimes hydrothermal fragments cemented by mostly hydrothermal precipitates, named slabs. This low permeability cover may favour sub-surface precipitation of MS ores. Rainbow and Saldanha are interesting because (1) ultramafic-associated MSD seem to be very rare, with significant deposits apparently restricted to the Precambrian; (2) Rainbow, with one of the main hydrothermal plumes known, may be a good example of dispersion; (3) at Saldanha there is a sea water methane anomaly and only weak venting through sediment. Sub-sediment sulphide precipitation may be dominant with little loss to the water column. The presence of a cap rock will enhance sulphide precipitation (1) increasing the residence time of the hydrothermal fluid thus greatly reducing dispersion; (2) preventing sulphide oxidation. In productive hydrothermal fields most of the ore-forming activity may take place under the sea floor.