Diagenetic overprinting on metalliferous sediments at the TAG Hydrothermal Field (MAR, 26°N)

ADELINE DUTRIEUX[1*], ANNA LICHTSCHLAG[2] & BRAMLEY MURTON[2]

[1]University of Southampton, National Oceanography Centre, SO14 3ZH, UK (*A.Dutrieux@noc.soton.ac.uk)
[2]National Oceanography Centre, Southampton, SO14 3ZH, UK

Sediments in the vicinity of the hydrothermal seafloor massive sulphide mounds participate in the long process of weathering of the primary mineral deposits. To address the significance of this weathering, we investigated the post-depositional processes occuring in these sediments characterised by high concentration of metallic particles.

Sediment samples were collected by gravity coring, megacoring and rock drilling at the TAG Hydrothermal Field (Mid-Atlantic Ridge, 26°N) during 2016 as part of the EC FP7-funded *Blue Mining* project (604500). The cores were analysed for bulk chemistry and scanned for high-resolution chemostratigraphy. Bulk mineralogy was determined by XRD and SEM. Pore waters were analysed for cations, anions and hydrogen-sulphide.

The lithology of the sediments reflects their geological environment, *e.g*. low-temperature hydrothermally active zones, hydrothermally extinct mounds and distal sediment depositionary channels. Together with the rare earth element geochemistry, we find that sediment accumulation results from a number of proccesses: collapsing and weathering of chimney material, *in-situ* authigenic mineralisation, filling of the channels by mass wasting of partially or fully oxidized material, and the settling of hydrothermal plume fall-out. For example, distal sediment channels contain sulphide sands composed of cubic grains of pyrite and partially dissolved grains of sphalerite, covellite and chalcopyrite that reflect the high-temperature primary composition of hydrothermal chimney material. These alternate with iron oxyhydroxides and silicates, sourced from weathered chimneys and low-temperature deposits, revealing cycles of high and low-temperature hydrothermal activity. In contrast, pore water compositions are decoupled from the solid phase and reflect diagenetic overprinting of redox-sensitive elements (Fe, Mn), possibly by microbial activity. Despite being buried, the distal channel sediments undergo continuous modification, with metal remobilisation playing a significant role in the weathering of the mineral resources.