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High-resolution trace element profiles in a cold seep vestimentiferan tube

G. Bayon (1), **S. Duperron** (2), C. Pierre (3), A. Boetius (4)

(1) Département Géosciences Marines, Ifremer, Plouzané, France, (2) Université Paris 6, UMR 7138, Paris, France, (3) LOCEAN, Université Paris 6, Paris, France, (4) Max Planck Inst Marine Microbiol, Bremen, Germany

We report on a reconnaissance analysis of the geochemical composition of the chitineous tube of a 1m-long vestimentiferan tubeworm (Annelida: Siboglinidae) collected in a cold seep area off Egypt (Amon mud volcano, Nile deep-sea fan). Our aim has been to investigate whether high-resolution geochemical profiles along vestimentiferan tubes can provide information on the micro-environment conditions that prevail within the tube. Vestimentiferan tube worms rely on sulphide-oxidizing bacterial endosymbionts for their nutritional requirements. In fluid venting areas, those worms typically acquire sulphide from reduced sediments and oxygen from bottom waters.

Here, we show for the first time that large variations in trace element concentrations occur along the tube. Elements associated with terrigenous material (e.g. Al, K, Fe, Th, REE) are clearly enriched in the posterior extension of the tube, indicating that this part has probably grown within the sediment. In contrast, a number of redox sensitive trace metals (e.g. Ni, Cu, Zn, As) exhibits strong enrichments in the mid-part of the tube (from $\sim$ 10 to 30 cm below the top anterior part), with element/Al ratios being up to 5000 times higher than detrital ratios. Our preliminary working hypothesis is that those enrichments reflect a time-integrated oxic-anoxic transition zone, related to the mixture of seawater (oxic) and pore waters (anoxic) within the tube. Additional work will include SEM characterization of the tube to identify the phases hosting those elements (e.g. sulphide minerals, oxides, chitineous matrix, detrital grains), and measurement of stable isotope ratios (δ^{13}C) to further constrain their source (seawater vs. pore water).