A multi-approach study on active fluid seepages and associated authigenic carbonates in the vicinity of the Capbreton submarine canyon (Bay of Biscay)

Hervé Gillet*[1], Marie Sieurac[1], Lucas Gonzalez[1], Léa Gazzoli[1], and Karine Charlier[1]

[1]Environnements et Paléoenvironnements OCéaniques – Université de Bordeaux – France

Résumé

On continental margins, submarine canyons facilitate the release stocks of fluids, or are themselves sinks for sediments leading to the genesis, storage and subsequent release of these fluids. Fluid seepages around such reservoirs have been well documented and correspond most often to pockmarks or crusts of authigenic carbonates on the seafloor.
In the Bay of Biscay, the 2010's oceanographic cruises revealed numerous active fluid seepages on the edge of the Aquitaine shelf, characterised by both MDAC-type carbonate crusts on the seabed and bubble plumes in the water column. However, until now, no active fluid seepage had been detected in the Capbreton canyon.

Recent dives with the "Ariane" HROV in this canyon (HaPoGe campaign, 2017) and a participatory science project with amateur divers have enabled us to collect rock samples on the canyon rim that completely challenge our interpretation of these rocky outcrops. Our study is based on the analysis of 10 samples, for which we carried out, lithological microfacies in thin sections, cathodoluminescence, XRF analyses, calcimetry, and carbonate isotope analysis.

All the samples are fine to medium-grained mix silico-clastic/bioclastic sandstones with carbonate cements. Three type of outcrop are described in-situ: fields of blocks and boulders (on the plateau edge) ; subhorizontal sandstone beds (_˜1m) with metric clay interbeds ; vertical columnar forms in interbeds or isolated, sometimes ramified, with diameters ranging from decimetric to pluridecimetric. Some of the chimney-shaped samples are unambiguously reminiscent of cold seepage conduits. Isotopic analyses confirm that the cement in these sandstones is of authigenic origin, most having a MDACs-type signature.

In addition, water column MBES data (SEDYMAQ 4 Campaign, 2018) reveal a large number of bubble plumes emanating from the seafloor on the rim and on the lateral slope of the Canyon, demonstrating that these fluid outflows are active. To date, these are the first active fluid seepage discovered in the immediate vicinity of the Capbreton canyon.
These fluid seepages evidences are often located above underlying filled incisions (landslides scars, paleo-canyons). It raises questions about the hydraulic dynamics of the system over time and space, i.e., origin, transient storage, transient conduits, and escape zones.

Mots-Clés: submarine canyon, authigenic carbonate, seepage, bubble plume

*Intervenant