Master 2 internship
Place: IFREMER, Brest, France
Duration: maximum 6 months, between January-September 2024

Transfer and deposition of sediment and particulate organic carbon in the Capbreton canyon

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Rationale and aim:

Submarine canyons are conduits that cut across continental margins and funnel the transport and deposition of sediment from the continent into the deepest reaches of the ocean. Associated to this lateral transfer of sediment, organic carbon is transported and ultimately buried in canyons and deep-sea fans settings in amounts that can play a role in long-term changes in atmospheric CO_2 and climate (Rabouille et al. 2019; Talling et al. 2024).

This lateral transport is commonly driven by avalanches of sediment called turbidity currents. However, triggering mechanisms, volume and *in fine* efficiency of turbidity currents in the transfer and burial of sediment and carbon vary greatly with canyon morphology, sediment source and oceanic and meteorological conditions (Talling et al. 2024). To expand the knowledge on the global role and impact of canyons in sediment and carbon cycling, all types of canyon settings must be considered and investigated.

The Capbreton canyon incises a narrow continental shelf and is fed by longshore drift (i.e., type 2 canyon, *sensu* Talling et al. (2024)). However, prior to the 16th century, the Adour River, the main river in the area, was located in Capbreton and the canyon head was possibly directly connected to the river. The canyon shows morphological characteristics of muddy canyons with a meandering thalweg flanked by sedimentary terraces. Active sediment transport, erosion and deposition were detected in the canyon based on sub-annual modifications of the canyon floor morphology in the canyon head (Mazières et al. 2014) and along the thalweg down to 1500 m water depth (Guastrennec-Faugas et al. 2020, 2021). Furthermore, previous studies measured turbidity currents and a dynamic turbid layer in the canyon (Mulder et al. 2012; Guastrennec-Faugas 2020), and high sedimentation rates (>1 cm/year) on muddy and sandy terraces along the thalweg (Gaudin et al. 2006; Brocheray et al. 2014, Mary et al. 2015).

The aims of the proposed study are to 1) extend the knowledge of sedimentary processes along the canyon to the distal reaches at 4000 m and 2) investigate for the first time the organic carbon preserved in the deposits. For this purpose, up to 0.60 m long multicores were collected on sedimentary terraces along the canyon at several water depths (500 m, 1000 m, 1500 m, 2000 m, 2500 m, 3000 m, 3500 m and 4000 m) during expedition 64PE523-PLUMFLOC from the NIOZ (The Netherlands) in collaboration with IFREMER (France)

Objectives:

- Identify processes of sediment transfer based on sedimentary facies
- Quantify the amount of particulate organic carbon (POC) in canyon sediment cores
- characterize the stratigraphic and spatial fluctuations of sedimentary facies and POC along the canyon
- Propose a scheme of sediment and POC transport/distribution in the light of canyon morphology and hydro-sedimentary processes along the canyon from 500 m to 4000 m water depth.

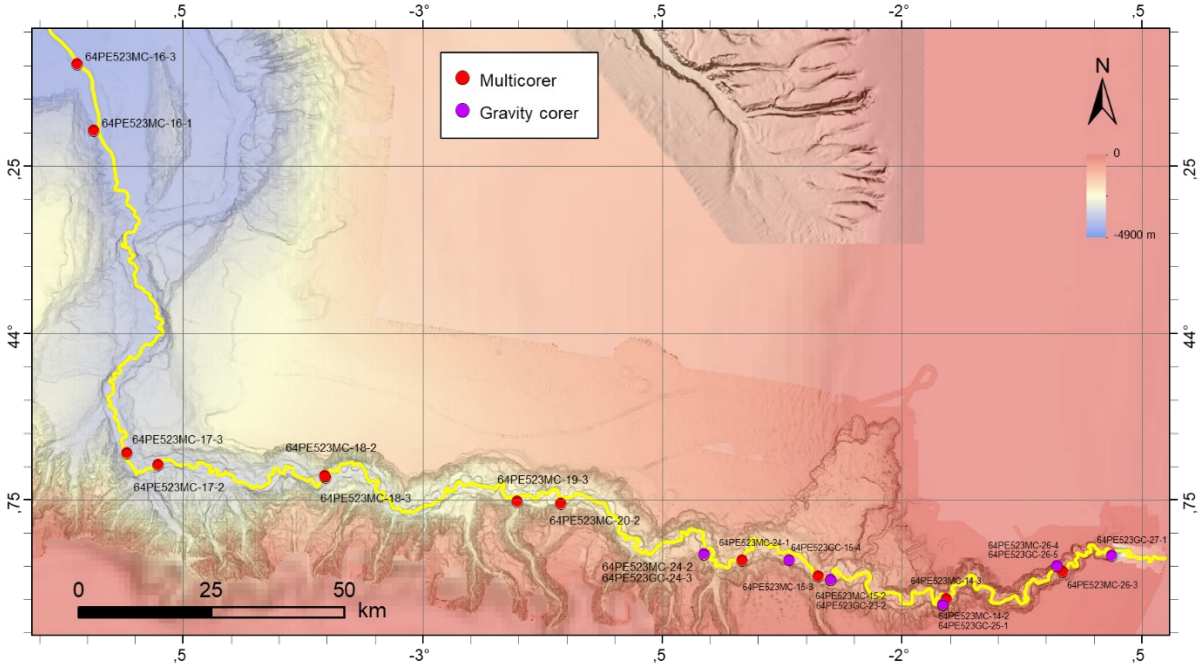
Data:

- 16 mutlicores, 6 gravity cores
- 5 m to 40 m multibeam bathymetry

Expected work

- Description of sedimentary facies

- Acquisition of physical and chemical properties of sediment (Multi-Sensor Core Logger, XFR scanner)
- Grain size analysis
- Total organic carbon analysis
- Organic carbon stable isotopes analysis
- Integration of morphologic, sedimentologic and geochemical data



Location of multicores and gravity cores retrieved in the Capbreton canyon

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