# Geochemical and microbial signatures of the microbial methane filter in Black Sea sediments

Marine sediments contain the largest reservoir of methane on Earth; however, the ocean contributes only minimally to the atmospheric methane budget. This indicates that only a small fraction of methane is transferred from sediments to the atmosphere, in part due to the efficiency of benthic microbial filters in marine sediments. Among these mechanisms, the Anaerobic Oxidation of Methane (AOM) constitutes a significant methane sink, responsible for an estimated annual consumption of 45-61 Tg of diffusive methane fluxes in subsurface marine sediments. The Sulfate-Methane Transition (SMT) is a sedimentary interface where methane is consumed by anerobic methane oxidizing archaea (ANME), forming syntrophic consortia with sulfate-reducing partner bacteria. However, previous geochemical analyses in the western Black Sea sediments of Romanian slope during the GHASS2 Ifremer cruise in 2021 suggested that this microbial filter had low efficacy.

The goal of this project is to expand our understanding of AOM in the Black Sea sediments offshore Georgia and Bulgaria, broadening the geographical scope of the spatial distribution of microbial communities involved in AOM process. We propose to study the geochemical interfaces coupled to microbial diversity in order to provide evidence of AOM in sediments collected in June 2024. The first objective is to measure the carbon isotopic composition of methane to pinpoint the SMT using a new generation of laser mass spectrometers. The second objective is to perform DNA extraction on selected sediment samples guided by geochemical results. The student will conduct PCR-amplification of the gene encoding the small 16S ribosomal subunit in order to construct libraries for high-throughput sequencing. Additionally, the student will handle bioinformatic processing with graphical and statistical representation using R.

This project aims to provide valuable insights into the spatial distribution and efficacy of the microbial methane filter in Black Sea sediments, thereby contributing to a better understanding of the microbial filter on the methane budget of the largest anoxic basin on earth.

The ideal candidate should have a background in marine chemistry/geochemistry and an interest in developing competencies in microbiology, or *vice versa*.
The internship will take place at Ifremer Centre Bretagne in Technopôle Brest-Iroise ZI de la pointe du Diable CS 10070, 29280 Plouzané (France).

The training will be co-supervised by Dr. Antoine Crémière (Geo-Ocean) and Dr. Laurent Toffin (BEEP). Interested candidates should send a short cover letter, CV and contact details of referees to antoine.cremiere@ifremer.fr and laurent.toffin@ifremer.fr