Etude RETROspective des socio-écosystèmes côtiers à partir des SEDiments estuariens. L'étude du site pilote régional de la Rade de Brest :

trajectoires passées sur les deux derniers siècles.

Retrospective study of coastal socio-ecosystems based on estuarine sediments. The study of the regional pilot site of the Bay of Brest: past trajectories over the two last centuries.

The PhD project consists in an interdisciplinary study of the macro-tidal estuarine environment of the Bay of Brest (BoB), a coastal ecosystem that has been exposed to strong anthropogenic pressures over the past decades, especially post-World War II (WWII). The thesis aims at reconstructing, through sediment cores retrieved in the BoB, past environmental changes, at a high temporal resolution (subdecadal to annual), over the past (at least two) centuries, to create the first complete chrono-systemic timeline of main BoB socio-ecosystemic changes from land to sea. All data obtained from BoB sediment cores will be compiled by the PhD: some data will be directly acquired by the PhD (under supervision: A. Penaud, J. Sutton, M. Vidal) and other will be acquired in collaboration thanks to the interdisciplinary team mentioned in page 3.

In the PhD, past changes in coastal biodiversity will be studied using fossilized marine bioindicators including: i) dinoflagellate cysts (under the supervision of A. Penaud), ii) diatoms (under the supervision of J. Sutton) as well as iii) benthic foraminifera (in collaboration with E. Goubert in the framework of two Master 2 internships planned in 2023 and 2024). Microfossil analyses in sediments will be combined with biomolecular tools, so as to discuss protist community changes as a whole, also targeting toxic species, through ancient sedimentary DNA. This part is planned to be conducted in collaboration by the Ifremer team of R. Siano though a two-year long post-doctoral position (2023 to 2025). In parallel, changes in BoB landscapes will be investigated using sedimentological analyses (in collaboration with A. Ehrhold and J. Goslin), pollen tracers (under the supervision of M. Vidal), while the sources and dispersion of historical pollutions (occasional or chronic) will be investigated using trace metals and Pb isotopes. This last point will be carried out in collaboration with S. Révillon.

All data from sediment cores will be gathered with instrumental (IUEM observatory services and watershed managers) and historical data (ongoing PhD that started in October 2021 between IUEM and CRBC untitled "HISTORADE") over the past two centuries. Finally, in parallel with the thesis, a model of the land-sea continuum will be developed in collaboration with M.Raimonet (though a second two-year long post-doctoral position from 2023 to 2025). This model will be validated with current environmental data before being applied to the pre-WWII period. The model (post-doc) data (PhD) intercomparison will allow i) to discuss robust causal relationships between the different eco-socio compartments established thanks to paleo-reconstructions, and ii) to simulate as accurately as possible past to current trajectories, then allowing to consider the simulation of future trajectories under different scenarios in a next future (not planned before the end of the PhD)

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