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A 2D observation station for monitoring the water column biogeochemistry in dynamic coastal shelf systems

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River-dominated ocean margins (RiOMar) are highly dynamic interfaces where river inputs, hydrodynamics, seasonal stratification, storm-driven resuspension and rapid biogeochemical transformations interact on short spatial and temporal scales. Although these environments are particularly vulnerable to global change, their functioning is still poorly documented due to sparse and weather-constrained observations. The West Gironde Mud Patch (WGMP) is a river-dominated system located on the mid-shelf of the Bay of Biscay where favorable hydrodynamics led to the deposition of Gironde-derived fine sediments. Benthic biogeochemical processes are enhanced by a seasonal deoxygenation of bottom water, episodic inputs of organic matter (bloom, river flood), and sediment resuspension during storms. However, the absence of continuous *in situ* measurements limits the ability to assess the ecosystem vulnerability to expected changes in river discharge, summer stratification and storm regimes, highlighting the need for sustained water-column monitoring.

To address this gap, a 2D observation station was developed based on the inovative Mastodon concept (Ifremer, France), and adapted to the energetic hydrodynamic conditions of the Bay of Biscay (tides, swell, waves and storms). The system is also designed for deployment from small vessels in both coastal and offshore settings. It consits of a triangular stainless-steel seabed frame with adjustable feet to ensure stability, a Dyneema® mooring line, and a subsurface float equipped with an acoustic release mechanism for recovery after long-term deployment. A set of adaptable sensors is mounted on the seabed frame, along the mooring line and beneath the float, enabling continuous measurements of temperature, salinity, pressure, dissolved oxygen, pH, turbidity and chlorophyll-a from the seafloor to the near-surface of water. The simultaneous deployment of several units within a given area provides the opportunity tp make high-frequency observations with 2D spatial coverage, allowing for the detailed characterization of seasonal hydrological and biogeochemical variabilities. Initially conceived to monitor stratification dynamics and bottom-water deoxygenation in the WGMP, the observation station is a flexible platform customizable to a wide range of coastal biogeochemical applications. This contribution describes the system’s design and technical characteristics, and presents results from its first deployment in Arcachon Bay.