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Environmental factors influencing deposition and preservation of laminated sediments in Edisto Inlet, western Ross Sea (Antarctica)

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Laminated diatomaceous deposits have been documented in some regions of Antarctica, including the Antarctic Peninsula and the Ross Sea. In general, very high sedimentation rates can overwhelm limited bioturbation, thus favoring the varve preservation, for example, in certain glacio-marine environments. The laminated sediments collected in the Edisto Inlet, western Ross Sea, exhibited well-defined dark and light laminae on a mm- to cm-scale. Dark laminae contained relatively high concentrations of a biomarker for fast ice, $IPSO_{25}$, while low $IPSO_{25}$ concentrations characterized the light laminae, and the diatom *Corethron pennatum* became the dominant species. Based on these assumptions, the dynamics of fast ice was reconstructed over the last 2.6 ka for the western Ross Sea. However, the absence of direct observations leaves the paleoclimatic and paleoceanographic interpretation of these laminated sediments with a certain degree of uncertainty.

The project LASAGNE (Laminated Sediments in the Magnificent Edisto Inlet, Victoria Land: What processes control their deposition and preservation?), funded by the Italian Program of Antarctic Research (PNRA), proposes a multidisciplinary study that integrates the characteristics of fast ice, water column, and surface sediment, aiming to obtain information on the factors influencing both formation and preservation of laminated sediment in Edisto Inlet. The project integrates also biological data (phytoplankton, microzooplankton and foraminifera) collected *in situ*, and time series of satellite images of sea ice. The main goal is to provide new insights into the sub-seasonal formation of laminated sediments, offering a backbone for the interpretation of paleoclimatic sedimentary archives.

Here, we present the results obtained from a comprehensive dataset collected in Edisto Inlet during the XXXVIII Italian PNRA expedition conducted on board the I/B Laura Bassi in February 2023. Collected data include CTD (Conductivity-Temperature-Depth) profiles with additional parameters (Dissolved Oxygen, fluorescence, turbidity) spatially distributed within and at the entrance of the bay, which was still partially covered by seasonal sea ice at the time of the cruise. Additionally, vessel-mounted and lowered ADCPs (Acoustic Doppler Current Profilers) were collected along transects and at each CTD station, respectively. The synoptic survey conducted during the austral Antarctic summer is used to describe the distribution of water masses and current dynamics in the bay, primarily driven by sea ice formation and melting, as well as

atmospheric and tidal forcing. Time series obtained from a mooring deployed 1-year before the cruise (data covers the period February 2022 - February 2024) provide thermohaline variability of the water column even during the winter season, and fluxes and composition of organic debris sinking in the water column through time-series sediment trap samples. Sea ice cores, short sediment cores, and water samples are used to gain insight into the phytoplankton and microzooplankton living in platelet ice in spring and in open water in summer, respectively. Early diagenesis has also been taken into account to define how the original signal is preserved in the sedimentary record.

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