Hydrodynamic Processes Revealed in Baixo Vouga Lagunar Sediment Profile

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FIGURE 1

Simplified geological map of the study area showing the location of the sampling point circled in red.

FIGURE 2

Variation in pH and EC, granulometry and transition zone between unit 1 and 2 in vertical profile. a) diatom typical of a freshwater environment; b) diatom typical of a marine and brackish environment. The Baixo Vouga Lagunar (BVL) forms part of the Aveiro coastal lagoon-barrier system, originating in the 10th century and largely becoming isolated from the Atlantic Ocean by the mid-18th century due to sand accretion and the development of a sandbar.

This study aims to investigate coastal evolution mechanisms and evaluate depositional dynamics within the BVL, utilizing sedimentological and geochemical analyses of a sediment core collected from the area (Figure 1). The study considers the natural and/or anthropogenic factors that could influence these processes. Analysis of sediment samples along the vertical profile reveals two primary units (Figure 2). The lower unit (unit 1) is sand-dominated, exhibiting pH values ranging from 5.0 to 8.8, low electrical conductivity, and minimal concentrations of AI, Fe, Mn, and K, indicating direct marine influence during deposition. Unit 1 likely corresponds to ancient or remobilized beach sediments predating lagoon

formation. In contrast, the upper unit (unit 2) features generally lower pH values (4.7-7.7) and higher electrical conductivity, indicative of reduced marine influence and the establishment of barrier/lagoon conditions with less energetic deposition under tidal dynamics. A transitional unit between the two is characterized by a significant decrease in sediment grain size (predominantly silt and clay fractions) alongside an increase in terrestrial elements, notably Al, K, Fe, and Mn. The identification of diatoms in some samples distributed along the profile confirms the observed results. These diatoms, linked to their respective habitats, highlight the alternation of marine, freshwater, and brackish water influences throughout the profile. Specifically, they indicate a dominance of marine influence in unit 1, an alternation between freshwater, brackish, and marine conditions in the middle part of the profile, and a freshwater influence consistent with the high salt marsh environment in the upper part of the profile (Figure 2).

