



## **Micromorphological and mineralogical characters of the Entre Valas SEV coring (Santarém, Portugal): evolution from a transitional to a continental sedimentary environment during the Holocene**

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The present work focuses on the soil micromorphological component of a multi-disciplinary study performed on a 20m-deep core drilled in the Tagus River alluvial plain in Entre Valas, few kilometers upstream of Santarém (Portugal). The micromorphological analysis presented here relies on palynological, sedimentological and geochemical data gathered by a multidisciplinary team encompassing researchers from Univerisidade de Lisboa and Università di Padova. The SEV (Santarem Entre Vales) core is representative of the evolution of the Tagus River valley during the last 15ky, encompassing Late Glacial and Holocene sediments. Eleven thin sections were studied from the uppermost 15m of the core, corresponding to the Holocene sedimentary series. The lowermost part of the series corresponds to a deltaic/estuarine sedimentary system, with shallow freshwater backswamp ponds receiving occasional inputs of marine water during exceptional high tides or maybe during storms with strong western winds from the Atlantic ocean. In this lowermost group of samples pyrite is present in large quantities, mainly as single framboids or as aggregates of framboids associated with organic matter. In two thin sections, characterized by very fine grained sediments and common phlobaphene-rich organic residues, jarosite was observed in association with gypsum (elongated prismatic crystals and "powdery" accumulations).

Jarosite occurs as hypocoatings and infillings of planar voids, preferential pathways for the oxidation of pyrite and as pseudomorphs after pyrite framboids. The formation of the jarosite-gypsum mineral association is most likely due to oxidation of sulphidic materials caused by post-sampling aeration. The upper part of the core intercepts the transition from the lower deltaic/estuarine sedimentary complex towards an alluvial plain situation during the Middle and Upper Holocene. Micromorphology failed to reveal indicators of sedimentary hiatuses accompanied by pedogenesis. Orthic calcite nodules without exclusion of skeletal grains and micritic calcite hypocoatings, often juxtaposed to microsparite infillings, are generally ascribed to the gradual infillings of microvoids under vadose circumstances, thus not necessarily to soil formation related to a stable surface. Moreover the samples in this interval present almost no porosity, no microstructure, no traces of biological activity (e.g. calcite biospheroids, excremental pedofeatures). Interestingly, at a depth of 3,5m pedo-relicts of former topsoil horizons which have been eroded and re-deposited were observed. Abundant finely comminuted charcoal and charred organic matter fragments appeared to be dispersed in the groundmass. The existence of a phase of topsoil erosion, which could be man-induced (but the occurrence of natural fires should not be excluded), might relate to phases of deforestation and heathland expansion which in the region are known, from archaeological evidence, to begin in the Bronze Age.