

The regional expression of Late Pleistocene climate and environmental variability in the alluvial record of Côa River Valley (northeast Portugal)

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Abstract

In a fluvial setting, compositional and textural data of alluvial sedimentary deposits can provide crucial information on the paleoenvironments of the corresponding catchment when the geology and geomorphology of the source area, the mechanical selection processes during transportation, and possible recycling effects are considered in their interpretation. In this type of sediments, the clay minerals are commonly produced by weathering processes and, generally, the degree of chemical weathering is strongly controlled by climate. In the framework of the ongoing CLIMATE@COA project (COA/CAC/0031/2019) and giving continuity to a previous one (PALÆOCÔA - PTDC/EPH-ARQ/0326/2014), a ~3.5-m-thick floodplain sequence exposed at the Cardina/Salto do Boi archaeological site, in the Côa River Valley (northeast Portugal), was analysed. Some vertical variations in the sedimentary facies, bulk chemical composition (major and trace elements, including REE), degree of chemical weathering (by geochemical indices), grains size, and clay mineral assemblage, as well as in the petrographic characteristics and abundance of organic particles, were observed. Twelve luminescence ages, obtained on feldspars using a multi-grain pIRIR protocol, led to the establishment of a robust age-depth model for this alluvial body covering the time interval ~150-23 ka. The observed stratigraphic changes reveal the relationship between sedimentary environments and the degree of chemical weathering during the penultimate glacial-interglacial transition, the last interglacial and most of the last glacial cycle. Preliminary results suggest that late Marine Isotope Stage (MIS) 6 (~150-132 ka) and MIS 5e (~132-116 ka) were characterized by overbank sedimentation under low-intense precipitation with periods of enhanced effective moisture (rainfall seasonality). The MIS 5d-5a interval (~116-71 ka) seems to be dominated by low-water vertical sedimentary accretion linked to progressively colder but still humid conditions. During MIS 4, 3 and 2 (~71-23 ka), the alluvial sedimentation, punctuated by incipient pedogenic activity, witness the climatic variability documented for this period in the North Atlantic marine record. A sedimentary hiatus, without a clear erosion, is highlighted at around 40-32 ka. This multi-analytical approach combines geomorphological, sedimentological, geochemical, petrographic, and geochronological analyses. It brings new insights into the Late Pleistocene environmental changes and frames it within the regional evolutionary pattern of the western Iberia climatic variability.

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