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Facies and microfacies characterization of relict periglacial stratified slope deposits in the Côa Valley region (northeast Portugal)

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The geomorphological and sedimentary dynamics related to cold-climate conditions that occurred during Last Glacial Period constitute one of the most relevant factors in the recent relief evolution in mainland Portugal. Among them, low-altitude cold non-glacial processes (periglacial) are well-known north of Lisbon, from coastal areas to the inland regions of Hercynian Massif, through the carbonate massifs of central Portugal. However, a comprehensive lithostratigraphic and chronological characterization of relict periglacial stratified slope deposits, on different bedrocks (carbonate, schistose, and granitic), is still largely missing.

This study focuses on a ~3-m-thick deposit excavated at the Fariseu 9 archaeological site, located on the left-bank of the Côa River in the Iberian plateau ("*Meseta*" - northeast Portugal) and featuring Upper Palaeolithic and Neolithic remains. Standard facies and fabric analysis, coupled by soil-micromorphological and petrographic observations, were performed. Luminescence dating and laser diffraction particle-size analysis of the <2 mm fraction are in progress. Nonetheless, based on the stratigraphic correlations with three nearby sedimentary successions (G-81/82, G-92/93, and Rock Art Panel 1 profiles), dates by thermoluminescence, luminescence and radiocarbon, a chronology from the Lateglacial to the Younger Dryas for the studied deposit can be assumed.

The sedimentary dynamics are mainly related to mass wasting on a schistose (phyllite) bedrock, associated with frost-shattering. In the field, alternating openwork (or clast-supported) layers of large angular clasts, locally imbricated and organized into planar sedimentary structures, and intercalated beds with variable percentages of sand and silt, with limited evidence of weathering, are observed. Clast fabric is strongly slope-oriented both in the fine-grained and in the open-work stony layers, although the imbrication may show varying polarity and inclination among different beds. Some microfeatures, such as a concentric or circular pattern of quartz grains and rock

fragments, silt cappings developed onto rock fragments, and reworked clay coatings, may be considered indicators of debris-flow mechanisms combined with discontinuous frost action (freeze-thaw cycles). In the intercalated fine-grained beds, instead, the fabric characteristics and the presence of preferred oblique orientation of elongated grains point to water runoff and solifluction, which may be indicative of still cold and relatively more humid conditions. In addition, a well-defined erosive unconformity between the Pleistocene and Holocene records is observed in one of the thin sections.

The occurrence of these relict slope landforms and deposits at low-altitudes (125-130 m), and the evidence of associated periglacial dynamics with three main sedimentary mechanisms that dominate the emplacement of the studied sediments (debris-flow, runoff, and solifluction), are used to identify different cold stages at a local scale. Based on these preliminary data, we suggest that a high frequency of freeze-thaw cycles would have occurred during these stages, along with a seasonal renewal of a thin snow cover, whereas permafrost was absent. The combination of intersecting geomorphological, sedimentological, petrographic, and geochronological analyses of relict periglacial stratified slope deposits in the Côa Valley region, therefore, led to the reconstitution of late Pleistocene and early Holocene environmental changes for this area, allowing to discuss the relative importance of the forcing factors responsible for such land evolution.