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Colluvial deposits in Northwestern Spain: geoarchives to reconstruct Holocene gomorphological dynamic in archaeological areas

M. Costa Casais (1), J. Kaal (1), and A. Martinez Cortizas (2)

(1) Laboratorio de Arqueoloxía da Paisaxe (LAr), Instituto de Estudios Gallegos Padre Sarmiento, IEGPS-CSIC-XuGa, c/ Rúa de San Roque, 2º, 15704. Santiago de Compostela, Spain (nue.costa-casais@iegps.csic.es and joeri@samage.net), (2) Universidad de Santiago de Compostela, Edafología y Química Agrícola, Santiago de Compostela, Spain (antonio.martinez.cortizas@usc.es, 034 981596904)

The main objective of our research was to evaluate the potential of colluvial deposits for the reconstruction of Holocene environmental changes. We focused on the evolution of landforms in the Campo Lameiro archaeological area (NW Spain), as a key factor in the configuration of alluvial and colluvial deposits. The studied area is a small hill, isolated by a series of N-S/E-W fractures that also determine the fluvial network. In order to develop our research we analyzed: a) relief structure and its role on formation, distribution and volume of colluvial deposits; b) key sedimentary features; and c) elemental composition and physico-chemical properties of the inorganic phase and molecular composition of the organic matter of the sediments/soils.

The geomorphological and sedimentological analyses indicate that the distribution of present landforms is a primordial factor to understand the formation of the colluvial deposits. Granitic macroforms dominate the landscape of the area, constituted by alveolar depressions surrounded by crests and granitic slabs. The thickest sedimentary deposits were found in the alveolar depressions, and showed the greatest variety of stratigraphic layers. Their sedimentary features depend on their location, i.e. near outcrops –summit, backslope– or in the alveoli –footslope and toeslope. We identified two main stratigraphic units: a basal inorganic layer represented by alluvial-colluvial sediments, formed in a highly energetic environment, probably dating to the Younger Dryas (>11,000 years BP) and, a younger unit of thick sandy, blackish, organic matter rich, colluvial soils (traditionally known as Atlantic rankers). The oldest radiocarbon age obtained for this unit dates back to 11.240-11.130 cal. BP. The Holocene colluvial soils show discontinuity features (stone lines, gravel, sand and charcoal layers) and significant vertical variations in pH, elemental composition of the inorganic phase (Ti, Zr, Fe, Al) and the molecular composition of the soil organic matter (particularly the abundance of pyrogenic material). These features are evidence of the occurrence of several phases of landscape instability. On one side, some of the phases of instability are coeval with known periods of Holocene abrupt climate change: the 8.2 ka event, the beginning of the Neoglaciation - ca. 6 ka BP- or the 2.8 ka wet/cold event. It also seems that variations in humidity have been a major driving force in the formation of the colluvial deposits. Nevertheless, some of the most intense erosive/cumulative phases do not match with rapid Holocene climate changes but coincide with periods of increased human pressure on landscape. Charcoal layers, burnt soil layers and the highly aromatic nature of the soil organic matter point to frequent fire episodes. Pollen studies also indicate a sharp decrease in forest cover beginning by ca. 6500 cal BP, accompanied by a progressive soil acidification with time. Since that moment, the instability phases coincided with known cultural periods (Neolithic, Bronze Age, Roman Period, the Middle Ages, etc.).

Our results suggest that both climate and human activities played an important role in the formation of colluvial deposits in the studied area. In agreement with previous research, this indicates that they are valuable geoarchives to reconstruct Holocene environmental change.