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High-resolution paleoclimatic analysis of a paleosol-bearing alluvial succesion, Plio-Pleistocene of Argentina

Elisa Beilinson (1) and María Sol Raigemborn (2)

(1) Centro de Investigaciones Geológicas (CONICET-UNLP), Argentina (beilinson@cig.museo.unlp.edu.ar), (2) Centro de Investigaciones Geológicas (CONICET-UNLP), Argentina (msol@cig.museo.unlp.edu.ar)

Plio-Pleistocene paleosol-bearing alluvial strata of the Punta San Andrés Alloformation are continuously exposed along the marine cliffs of south-eastern Buenos Aires province, Argentina. Outcrops are dominated by floodplain siltstones and mudstones that exhibit a cyclic alternation between weakly to well-developed calcisols, vertisols and protosols. The study interval was deposited by a mixed, predominantly suspended-load fluvial system. The aim of this presentation is to determinate whether the evolution of the different types of paleosols was controlled by cyclic climatic changes in relation to the climatic deterioration that was registered during the Plio-Pleistocene of southern South America.

The studied unit is composed of a two-tier cyclic stratal hierarchy produced by the combined effects of autogenic and allogenic processes. The lower hierarchy was identified as meter-scale fluvial aggradational cycles. All together, the four identified cycles make up the higher, decameter-scale hierarchy. This is dominated by sandstone bodies encased in paleosol-rich floodplain deposits that change their relative participation from base to top, towards more channelized deposits. This fluvial succession is disconformably bounded, and was possibly generated in response to fourth-order episodes of eustatic sea-level rise and fall in the Atlantic Ocean. Identified paleosols show a general trend from protosols to an alternation between vertisols and gradually better developed calcisols.

In general, all the identified paleosol-types are characterized by the presence of carbonate cements, absence of redness of hue, low to moderate CIA-K values and a low alumina/bases ratio. All these suggests a weak base loss from the original soil and that the chemical weathering was low to moderate. This probably involved cool to temperate climates and a relatively low water percolation rate through feldspar and other weatherable minerals in soil parent material. The predominant occurrence of illite and I/S mixed-layer in all the studied paleosols suggests that mechanical erosion prevailed over chemical weathering. However, the presence of smectite and kaolinite in moderate to low concentrations indicates that some degree of chemical weathering must have taken place in these paleosols.

The stratigraphic arrangement of the recognized paleosols and the clay mineral distribution indicates that paleoclimate during the deposition of the lower Punta San Andrés Alloformation was subhumid, (average MAP $\sim$ 700 mm), seasonal and temperate (average MAT $\sim$7.7°C) for at least 1 Ma (late Pliocene-early Pleistocene), although with several intervals where conditions became drier and probably colder. All the paleoclimatic indicators show a certain degree of homogeneity. However, it is possible to establish a general trend in the climatic evolution registered in the paleosols to relatively less humid and warmer conditions towards the top of the studied interval. This identified climatic trend in the lower Punta San Andrés Alloformation deposits constitutes a proxy for late Pliocene to early Pleistocene climate from southern South America.