Geophysical Research Abstracts
Vol. 19, EGU2017-17738, 2017
EGU General Assembly 2017

Paleoenvironmental evolution and geomorphic dynamics recorded in the Homo-bearing Pleistocene stratigraphic succession of Aalat (Eritrea, East Africa): A pedological perspective

Fabio Scarciglia (1), Giuseppe Mercatante (1), Paola Donato (1), Massimiliano Ghinassi (2), Giorgio Carnevale (3), Massimo Delfino (3), Oriol Oms (4), Mauro Papini (5), Marco Pavia (3), Federico Sani (5), and Lorenzo Rook (5)

(1) Dipartimento di Biologia, Ecologia e Scienze della Terra (DiBEST), Università della Calabria, Arcavacata di Rende (CS), Italy (fabio.scarciglia@unical.it, giuseppe.mercatante114602@yahoo.it, paola.donato@unical.it), (2) Dipartimento di Geoscienze, Università di Padova, Padova, Italy (massimiliano.ghinassi@unipd.it), (3) Dipartimento di Scienze della Terra, Università degli Studi di Torino, Torino, Italy (giorgio.carnevale@unito.it, massimo.delfino@unito.it, marco.pavia@unito.it), (4) Departamento de Geologia, Universitat Autònoma de Barcelona, Bellaterra, Spain (JosepOriol.Oms@uab.cat), (5) Dipartimento di Scienze della Terra, Università di Firenze, Firenze, Italy (mauro.papini@geo.unifi.it, federico.sani@unifi.it, lorenzo.rook@unifi.it)

The Aalat stratigraphic succession represents a 300 m-thick continental archive in the northern sector of the African Rift Valley (Dandiero basin, Eritrea). Based on high-resolution magnetostratigraphy, along with tephrostratigrapic, paleontological and paleoanthropological data and correlations, the chronological constraints for the emplacement of this succession can be fixed at two stages characterized by normal polarity of the Earth's magnetic field, i.e. the base of the Jaramillo event and the lower part of the Brunhes chron, marking the Early to Middle Pleistocene transition. Remains of Homo erectus/ergaster and abundant fossil vertebrates were identified. Despite nowadays the study area has a typical arid, hot desert climate, the sedimentary succession records repeated shifts from fluvial to lacustrine facies, in line with dominant mammalian taxa characterized by strong water dependence and ichthyofauna typical of shallow-water fluvio-lacustrine paleoenvironments. The dominance of these water-controlled depositional environments over more than 250 ka suggests a major tectonic control, even though a clear overprinting of Pleistocene climate changes can be detected. The main morphological soil features, along with physico-chemical, mineralogical, geochemical and micromorphological data of selected soil profiles and horizons depict an overall poor to moderate degree of soil development, coherently with high rates of sedimentation of about 1 mm/year and local erosive phases. Nonetheless, the presence of calcic and especially petrocalcic horizons and one petrogypsic horizon at different stratigraphic heights clearly indicates cyclical phases of geomorphic stability, which allowed important leaching and accumulation of carbonate (or gypsum). Their complex, polygenetic fabric, often showing brecciation and re-dissolution features, points to a polyphased genesis, caused by changes in soil moisture conditions over time. This finding, together with the alternation of these cemented horizons with layers affected by local to extensive staining of the matrix with reddish to yellowish iron-oxides/hydroxides, suggests cyclical changes from dry to wet environmental conditions. This pattern is quite consistent with the main Pleistocene climate oscillations evidenced in global-scale paleoclimatic curves, where glacial/interglacial cycles of higher latitudes well correspond to the formation of carbonate- or gypsum-cemented and the iron-stained layers, respectively. In addition, some carbonate parent material enhancing secondary carbonate dynamics within the soil system, dominated by siliciclastic grains sourced from the metamorphic basement rocks prevailing in the Dandiero basin, could have been supplied as eolian dust during dryer (glacial) periods. A comparison of the different evolutionary (maturity-related) stages of calcic/petrocalcic and petrogypsic horizons of the chronologically well-constrained Aalat succession suggests that their time ranges of development were between 10^2 – 10^3 years and a few tens of thousands years.
Further investigations are required to assess the potential role of paleoenvironmental changes recorded in the Dandiero basin fill on human settlement, dispersal and evolution in East Africa during the Early-Middle Pleistocene transition.