



Micropedological approach to polycyclic pedogenesis in arid lands: the case of the Messak plateau (Libyan Sahara)

A. Zerboni (1), M. Cremaschi (1) and L. Trombino

Università degli Studi di Milano, Dipartimento di Scienze della Terra "A. Desio"

The Messak Sattafet is a wide plateau cut in Cretaceous sandstones, interpreted as relict of a Tertiary peneplain, heavily affected by fluvial dissection and aeolian deflation. Notwithstanding these degradation phenomena, discontinuous soil bodies are locally persevered below the stony desert pavement (hamada); this pedological bodies do not seem to be in equilibrium with the present-day climatic conditions. Micromorphological approach was chosen to investigate on the origin and climatic significance of selected profiles. Pedoplasation, rubification, clay translocation, and the redistribution of calcite in form of crystalline pedofeatures, are the main soil forming processes so far identified. These processes require a hydrological regime which does not exist at present in the area and they acted during different periods of the Quaternary and were interrupted by several erosional phases and episodes of aeolian input. U/Th analyses and archaeological remains allow dating the soil forming phases (alternating to arid periods) since the Middle Pleistocene up to the Holocene. Considered soils have to be regarded as palaeosols as they include relict pedofeatures. Moreover different pedological processes are superimposed, allowing to reconstruct the evolution patterns of paleosols. Formation of ferruginous nodules seems to characterize the oldest pedogenetic phase, immediately followed by an intense clay illuviation, forming red coatings and infillings; fragmentation of clay coatings (in form of papulae) and their incorporation in the micromass (producing a striated b-fabric) characterize the following pedogenetic phases; tentatively contemporaneous are a less intense clay illuviation phase and the first stage of calcite redistribution. Finally, calcite redistribution and re-crystallization are the pedogenic processes that better represent the

latter evolution phase of the Messak soils. They were favoured by a longer availability of water in the lower part of the horizons and by pedoturbation. On the base of field and micromorphological evidences it is possible to classify the Messak soils as lateritoid paleosols. The presence of such palaeosols in the Central Sahara can be explained by pedogenetic processes acting on stable surfaces in a warm and rainy pedoclimate (which nowadays can be found at in the sub-equatorial areas) during wet periods, while during dry phases these were almost stopped and soil bodies were effectively degraded by wind erosion and at most only the process of pedoturbation was active.