

Land erosion and associated evolution of clay minerals assemblages in Mediterranean region (Southern Turkey): Amik Lake

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ABSTRACT

Under Mediterranean context, continuous human occupation is attested in the Amik Basin (southern Turkey) since 6000-7000 BC. The Basin also is crossed by The Dead Sea Fault (DSF), a major neotectonic structure in the Middle East extending from the Red Sea in the south to the East Anatolian Fault Zone in the north. The study focuses on the mineralogy and clay mineralogy record of the Amik Lake occupying the central part of the Basin. Our objective is to constrain major mineralogical and clay minerals evolution in the area over the last 4000 years and assess changes that would be related to the different land uses during the different Bronze, Roman, Ottoman and Modern civilizations.

Sediments were collected at 1 to 2 cm intervals in core sediments up to a depth of 6 meters in the clay deposits. Geochemistry (XRF), mineralogy (XRD) and clay mineralogy are applied to study the sediment records. The age of the record is constrained combining radionuclide and radiocarbon dating. Chemical and mineralogical composition of sediments is quite diversified reflecting the significant geological variation of drainage basins. Abundant mixed-layer and partly disordered minerals characterize the different sedimentary levels recorded in those cores. Levels relatively rich in chlorite, illite and quartz are interpreted as corresponding to relatively dry periods, while more humid periods lead to more intensive weathering and consequently to the dominance of clay minerals more advanced in the relative stability scale, such as kaolinite. Smectite is taken to indicate a climate with contrasting seasons and a pronounced dry season.

The sedimentary record clearly shows two periods indicating strong soil erosion in the Lake catchment. The most recent erosion phase is modern. The oldest one would have started during the late Bronze period and lasted until the late Roman Period. The first and older period is attributed to a strong aggradation linked to major increase in erosion. Our study shows that this episode has specific characteristics: mixed-layer clay mineral, high percent in Ni, Cr and Mg coupled with significant amount of organic matter of terrestrial origin. Ni and Mg most probably come from the Amanos Mountains an ophiolitic belt indicating an intensive upland cultivation and possible exploitation of its mineral resource. The second period is attributed to the modern period. The signature of the increase in erosion is different, because most of the soil cover has already been eroded. Only a patchy thin and unmaturing soil cover exists since the Late Roman time. Erosion is associated with a marked increase of smectite-illite interstratified clay, goethite and hematite found in deep soil horizons. Moreover, a marked increase in Cr is showed and is probably related to an enhanced exploitation of its mineral resource and to a renewed land exploitation of the Amanos Mountain Range.