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Tectonic, human and climate signal over the last 4000 years in the Lake Amik record (southern Turkey)

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This study investigates the upper sediments infilling the central part of the Amik Basin in Southern Turkey. The Amik Basin is located in a tectonically active area: it is crossed by the Dead Sea Fault, 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. Continuous human occupation is attested since 6000-7000 BC in the Amik Basin. The study focuses on the sedimentary record of the Lake Amik occupying the central part of the Basin. Our objective is to constrain major paleo-environmental changes over the last 4000 years.

The lake has been drained and progressively dried up since the mid-50s. The absence of water column during the summer season allows to collect lacustrine samples along a 5 meter depth trench with a sampling resolution of 1 to 2 cm. Diverse complementary methods were applied to characterize the sedimentary record: i.e. magnetic susceptibility, grain size, organic and inorganic matter by loss-of-ignition, mineralogy by X-ray diffraction and core scanner X-ray fluorescence (XRF) geochemistry. The age of the record is constrained combining radionuclide and radiocarbon datings.

Structural disturbances observed in the lacustrine sediments record are linked with major historical earthquakes from the 6th to the 9th century AD due to the Hasipasa Fault rupture. In addition to the tectonic influence, the sedimentary record clearly shows two periods indicating strong soil erosion in the lake catchment: (1) the most recent erosion phase occurs over the Roman period to Present; (2) the oldest one would have occurred during the Late Bronze period. Such changes are most probably related to change in land use. In term of climate influences, the mineralogical and geochemical results allow to evidence variations in chemical weathering conditions in the watershed and lake water level fluctuations, respectively. The clay mineral assemblages attest for significant pedogenesis transformations, especially during the Islamic/Ottoman period. Based on XRF results, an increase in potassium is attributed to a lake development phase during a wet phase An overflow of the Orontes River would be responsible for clay deposition. By contrast, increased calcium and strontium rather correspond to a low lacustrine level and a drier period. The Bronze and Iron/Hellenistic periods are both characterized by low lake level with limited contribution from the watershed.
To conclude, our multiproxy study of the Lake Amik allows to decipher between tectonic, human and climate influences over the last 4000 years. Further step would be to compare the Amik record with other regional archives to evidence local and regional events.

Keywords: Climate; Weathering conditions; Land erosion; Clay mineralogy; Lake sediments; Last millenia.