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Identification of historic earthquakes in surface sediments by means of multi-proxy-analyses (Lake Sapanca, West-Anatolia, Turkey)

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Two large earthquakes (Mw 7.4 and 7.1) have struck western Turkey, east of Marmara Sea, on 17 August and 12 November 1999. Recurrent seismic waves devastated the area and induced huge damage with about 30.000 victims, 50.000 injured and up to 35 billions Euro of losses. To mitigate the disastrous effects of future earthquakes in the area, a better understanding of the entire earthquake process including its effects on the society, is needed. With an estimated slip rate of 1.5 cm/year, according to historical earthquake data and recent earthquakes the North Anatolian Fault (NAF) is one of the most active seismic structures in the East-Mediterranean area. In the past century, a sequence of seismic ruptures of the whole fault zone described a spatial and temporal pattern of triggered earthquakes of the NAF, with subsequent earthquakes rupturing from east to west in direction mega-city Istanbul. As a part of the EU- project "Reliable Information on Earthquake Faulting" (RELIEF), the aim of our research is to identify earthquake signals in the sediments from Lake Sapanca using a multi-proxy approach.

The temporal and spatial continuity of lake sediments make them a possible archive for the reconstruction of large seismic events. Lake Sapanca (West-Anatolia, Turkey) covers an area of 40 km^2 and is located east of the Gulf of Izmit, $\sim$90 km southeast of Istanbul at 30 m asl. Because of its position on the NAF system, Lake Sapanca is situated in a highly tectonically active region.

A short gravity corer was used in summer 2003 to sample the predominantly clayish to silty sediments at 12 sites along three transects. Our high-resolution, multi-disciplinary, palaeolimnological study investigated the upper 30 to 45 cm of optical mainly homogeneous sediments. Our presentation will focus on the sedimentological and geochemical results over the last century. Magnetic susceptibility measurements show distinct changes in all cores and allow a correlation of the cores across Lake Sapanca. The short cores show variations in the geochemical (μ-XRF, TOC/TC), sedimentological (X-ray photography, magnetic susceptibility, thin-section microscopy) and biological (diatom and pollen analyses) composition. These variations in turn reflect changes in the water chemistry of the lake as well as in the detrital sediment input, including changes induced by earthquakes.

Our results from Lake Sapanca have shown that the lake sediments can provide valuable proxy data for the reconstruction of paleo-earthquakes.