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Integration of borehole geophysical properties into surface multichannel seismic data sets: First results from the SCOPSCO ICDP project

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Lake Ohrid (Macedonia/Albania), located on the Balkan Peninsula within the Dinaride-Hellenide-Albanide mountain belt is probably the oldest, continuously existing lake in Europe (2-5 Ma). Multidisciplinary studies at Lake Ohrid prove that it is an important archive to study the sedimentary and tectonic evolution of a graben system over a long time period. Within the frame of the International Continental Drilling Program (ICDP) a successful deep drilling campaign was carried out in spring 2013 with more than 2000 m of sediment cores at four sites. Downhole logging was realized at each site after coring, enabling us to integrate geophysical and sedimentological data into seismic cross sections in order to get a profound knowledge of climatic and environmental changes in the catchment area. The longest record (∼569 m, site DEEP), recovered in the central part of lake Ohrid likely covers the entire lacustrine succession within Lake Ohrid Basin including several Interglacial and Glacial cycles. Sedimentological analyses are still ongoing; however, the upper 260 m of the DEEP reflecting the time period between Mid-Pleistocene Transition to present.

An integration of borehole geophysical data into surface seismic lines shows that sediments, within the central part of Lake Ohrid, were deposited in a deep water environment over the last 600 ka. For the uppermost sediment cover, about 50 m of penetration, a very high resolution sediment echosounder data set allows us to identify major tephra layers and track them through the entire deep basin. Furthermore, a vertical seismic profile was carried out at site DEEP resulting in a conversion from two-way-travel-time into sediment depth. One major outcome is a corridor stack of the upgoing wave that clearly shows several reflectors linked to changes of sediment properties of cores and hence environmental and climate changes in the surrounding area of Lake Ohrid Basin. Several changes from Glacial to Interglacial, and vice versa, have been observed in the seismic data. Using a preliminary age model for interpreting physical parameters such as natural gamma ray, magnetic susceptibility, and sonic velocity shed light on causes and timing of additional reflectors at the site where the DEEP hole was cored in 2013. A grid of surface seismic lines enables us to expand this to the entire central basin and to reconstruct the sedimentary history of Lake Ohrid suggesting that the deep basin was in a rather stable condition with a water depth greater than a 100m.