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Sedimentological imprints of environmental variability at the Balkan Peninsula on the sediment sequence of Lake Ohrid (Macedonia, Albania) between the Mid Pleistocene Transition and present days: The ICDP SCOPSCO project

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The UNESCO World Heritage site of Lake Ohrid in the Balkans is thought to be the oldest, continuously existing lake in Europe. In order to unravel the geological and evolutionary history of the lake, a deep drilling campaign was conducted in spring 2013 under the umbrella of the ICDP SCOPSCO project. At the coring site “DEEP” in central parts of the lake, more than 1,500 m of sediments were recovered down to a penetration depth of 569 m blf. This sediment sequence is assumed to be more than 1.2 Ma old and likely covers the entire lacustrine deposits of the Lake Ohrid Basin.

Currently, an age model for the upper 260m of the DEEP- site sequence is available. This age model is based on chronological tie points (tephrochronology), and wiggle matching of down hole logging data and (bio-)geochemistry data (XRF, TIC, TOC) from the core sequence to the global benthic stack LR04 and local insolation patterns. The data suggests that the upper 260 m of the DEEP-site sequence corresponds to the time period between the Mid Pleistocene Transition (MPT) and present days.

During this period, the sedimentological properties of the sediments show a strong dependency on environmental variability in the area. Interglacial deposits appear massive or marbled, contain up to 80 % of $CaCO_3$ (high TIC), high amounts of organic matter (high TOC) and biogenic silica (high BSi), and low contents of clastic material. Glacial deposits are predominantly marbled and calcite is generally absent. Similarly, the amounts of organic matter and biogenic silica are low, and glacial sediments predominately consist of clastic matter. Distinct layers of siderite and uniformly distributed Fe- or Mn- oxides occur in the glacial deposits, vivianite concretions occur in both the glacial and interglacial periods.

High $CaCO_3$ contents in deposits formed during warm (interglacial) periods are also known from studies on short pilot cores from Lake Ohrid and are triggered by increased productivity in the lake, such as also indicated by enhanced contents of organic matter and biogenic silica. Thereby, $CaCO_3$ precipitation is caused by photosynthesis induced calcite precipitation during algae blooms in spring and early summer. Negligible contents of TIC in deposits formed during glacial periods can be explained by an overall low productivity (low TOC and BSi) and, in addition, by dilution of $CaCO_3$. Dilution of $CaCO_3$ might be a result of more acid bottom water conditions, triggered by improved mixing conditions (less thermal stratification), oxidation of OM and CO_2 release from the surface sediments. Oxygenated surface sediments and degradation of organic matter are indicated by the marbled structure of the glacial sediments implying intensive bioturbation, and by TOC/TN ratios around 4, respectively. The high amount of clastic material in deposits from cold (glacial) periods can be a result of mutual dilution with calcite, organic matter and biogenic silica, but might also indicate more intensive erosion in the catchment due to a less dense vegetation cover.