Lake Van Drilling Project 'PaleoVan' (ICDP): A long continental record in Eastern Anatolia covering several glacial-interglacial cycles

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Lake Van is the fourth largest terminal lake in the world (volume 607 km^3, area 3,570 km^2, maximum depth 460 m), extending for 130 km WSW-ENE on the Eastern Anatolian High Plateau, Turkey. The hydrologically closed lake tracks climate change with fluctuating lake levels, reflecting changes in the precipitation/evaporation ratio. Currently, lake water is highly alkaline (pH = 9.8) and saline (21 ppm). Within the sensitive climate region of north-eastern Anatolia, the Lake Van record, partly laminated, represents an excellent continental climate archive between the Black Sea, the Arabian Sea and the Red Sea that covers several glacial-interglacial cycles. Therefore, Lake Van is a key site within the International Continental Scientific Drilling Program (ICDP) for the investigation of the Quaternary climate evolution in the Near East. The ICDP drilling operation was carried out from July 2 to August 23, 2010. DOSECC, as operator of the deep drilling, has built the new Deep Lake Drilling System (DLDS), which was specifically designed for sampling sediments from deep lakes and which made its maiden voyage on Lake Van. The DSDL was operated at water depths of up to 360 m. We recovered a total sediment-core length of over 800 m. Two sites were drilled that reached maximum depths of 140 m (Northern Basin) and 220 m (Ahlat Ridge) below the lake floor, allowing an unprecedented look back in time at the scale of at least three glacial-interglacial cycles. Sediments during interglacial or interstadials are characterized by finely laminated carbonate varves, documenting variable annual particle cycles throughout the lake's history. Sediments deposited during glacials or stadials rather show homogenous to banded lithologies with an increased input of detrital material. The sediments of the very bottom of the Ahlat Ridge site document the initial phase of the lake formation, which was characterized by fresh water conditions. This is reflected by occurrence of fresh-water fauna and by significantly different pore-water chemistry. Several meter thick tephra layers originating from volcanoes surrounding the lake were also recovered, allowing reconstructions of larger volcanic events and related environmental impact. Furthermore, they offer through tephrachronology, radiogenic-isotopes and combined with paleomagnetic analyses the means to date the stratigraphic sections well beyond the range of radiocarbon dating.