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Determination of radiocarbon reservoir age of Lake Van by mineral magnetic and geochemical analysis

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Lake Van is the largest soda lake in the world, located on the east Anatolian Plateau in Turkey. Its varved sediments provide an excellent archive of high-resolution paleoclimate record for the Near East. Varve counting and radiocarbon methods are therefore important dating techniques for investigating the Lake Van sedimentary paleoclimate record. In here we present detailed magnetic and geochemical record of Lake Van. We have studied 4.56 m (core VP0801) and 4.70 m (core VP0807) long cores recovered from 80 m and 65 m water depths located in SE and SW of Lake Van, respectively. Here, we have
benefited from magnetic properties with associated remanent magnetization of the sediments from Lake Van to correlate the cores which contain of tephra layers. The cores cover the last 8.4 ka and lithologically include three laminated sedimentary units. From top to the bottom, the units were dated 4.2 ka BP-present, 5.4-4.2 ka BP and older than 5.4 ka BP. We identified tephra layers previously dated by varve counting, and used the varve ages to obtain age models for the cores. We also obtained a total of eight Accelerator Mass Spectrometry (AMS) 14C dates from total organic carbon (TOC) in the two cores, close to the tephra layers. Comparison of the varve ages of the AMS 14C dated samples with their corresponding AMS 14C dates indicates large differences, suggesting significant reservoir ages that range from 2.8 to 2.5 ka for 3.0-2.4 varve ka BP and from 2.8 to 3.3 ka for 8.0-5.9 varve ka BP. The results suggest that the reservoir age of the organic matter increases with the varve age of the sediments. This increase is mainly related to the rate of supply of “dead” carbon from the old carbonate rocks in the watershed of Lake Van, which was relatively higher during 8.4-5.9 ka than during 3.0-2.4 ka BP because of the higher atmospheric precipitation and higher rate of biochemical weathering during the former period.