Geophysical Research Abstracts
Vol. 13, EGU2011-8533-1, 2011
EGU General Assembly 2011

Holocene paleoenvironmental records of Lake Van (eastern Turkey) from mineral magnetic analysis

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We present the results of mineral magnetic measurements (χ, SIRM, ARM, NRM) and geochemical XRF Core Scanner elemental analysis from four cores located in water depths of 60-80 m in different parts of Lake Van, eastern Turkey. Lake Van is the fourth largest terminal Lake in the world by volume (607 km^3). It is 460 m deep and has a salinity of 21.4 per mil and a pH of 9.81. It is located on the East Anatolian Plateau with present day water level of 1648 m.a.s.l., and surrounded by Quaternary Volcanoes (Nemrut and Süphan) to the west and north, and the Bitlis metamorphic rocks to the south. It has accumulated varved-sediments with tephra units, which all provide important paleoenvironmental records. The sediments extending back to 14570 a BP have been previously dated by varve counting (Landman et al., 1996). We have correlated our cores with the varve-dated cores of Landmann et al (1996) using the tephra units. Our cores extend back to 9.5 ka BP (varve years). We also obtained 10 AMS C-14 ages from total organic carbon in our cores, which indicate reservoir ages ranging from 2600 to 4275 a; the reservoir ages generally increase with the varve age of the sediments.

Downcore profiles of all magnetic properties are highly correlatable between different cores, suggesting that the magnetic records are related to basinwide environmental changes rather than local effects. The magnetic properties of the cores are predominantly controlled by detrital paramagnetic minerals, with some contribution from small amount of ferrimagnetic minerals, all of which are derived from the catchment area. The tephra layers originating from Nemrut and Süphan volcanoes are characterized by strong ferrimagnetic minerals and high Zr, K, Si and Zn values. Downcore variation of magnetic properties and some geochemical elemental profiles (e.g., Fe, Ti, Zr, Ni, Ca) show good correlation .

The SIRM/χ and Mn profiles show wide variation during the last 3.5 ka suggesting significant redox changes. During the same period, high HIRM and χ_{ARM}/SIRM values indicate an increase in delivery of fine-grained detrital material. Low HIRM values and high χ_{ARM}/SIRM values during period 7.2-3.5 ka BP, show further decrease in the grain size of magnetic minerals. There is sharp change in the in all magnetic properties, but especially in HIRM and χ_{ARM}/SIRM, before 7.2 ka BP, indicating drastic increase in coarse magnetic minerals, which correlates well with high Zr and Ni values during the same interval. These results indicate high, but variable lake levels during the last 3.5 ka; still higher lake levels during 7.2-3.5 ka BP, and considerably low lake levels prior to 7.2 ka BP.

This work was supported by Scientific Research Projects Coordination Unit of Istanbul University. Project numbers: 1228 and 2475.

Referances:

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