Magnetic properties of tephras from Lake Van (Eastern Turkey)

Ozlem Makaroglu (1), Namık Cağatay (2), Lauri J. Pesonen (3), and Naci Orbay (1)

(1) Istanbul University, Geophysics Department, Istanbul, Turkey (ozlemm@istanbul.edu.tr, +90 212 694 7598), (2) Istanbul Technical University,Geology Department, Maslak, Istanbul, Turkey, (3) University of Helsinki, Division of Atmospheric Sciences and Geophysics, Helsinki, Finland

Here we present magnetic properties of tephra layers in the cores taken from Lake Van, Eastern Anatolia, Turkey. Lake Van is the fourth largest terminal Lake in the world by volume (607 km3). 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 large stratovolcanoes Nemrut, Suphan, Tendurek, and Ararat to the west and north. It has accumulated varved-sediments with tephra units, which all provide important paleoenvironmental records.

After a seismic survey, four different locations were selected for coring in Lake Van, with water depths varying between 60 m and 90 m. Four cores having between 3 and 4.8 m length were analyzed for for element geochemistry using XRF Core Scanner analysis. The sub-samples were taken into plastic boxes with a volume of 6.4 cm3 for mineral magnetic analysis. The mineral magnetic measurements included magnetic susceptibility (χ), anhysteretic remanent magnetisation (ARM), isothermal remanent magnetisation (IRM), hysteresis properties and thermomagnetic analyses.

According to the mineral magnetic measurements and geochemical analysis, we identified the five tephra layers (T1-T5). These tephra units were correlated with the previously varve-dated units of Landmann et al. (2011). The varve ages of the tephra layers were used to obtain the age-depth model for the cores. According to the age models the cores extend back to 9500 ka BP (varve years). Down-core profiles of all the magnetic properties are highly correlatable between different cores, suggesting that the magnetic records are of regional character. ARM values are found to be more convenient than χ values for correlating the tephra layers. The hysteresis parameters of samples taken from these layers indicate that they are within Pseudo Single Domain range. IRM curves show that low coersivity magnetic minerals are dominated in all tephra layers. Measurements of the temperature dependence of magnetic susceptibility suggest that the magnetic mineralogy at all tephra layers is dominated by magnetite. All tephra layers have distinct magnetic signature which are characterized by strong ferromagnetic mineral and high Zr and K values, suggesting their alkaline composition.

Landmann G, Steinhauser G, Sterba JH, Kempe S, Bichler M., 2011. Geochemical fingerprints by activation analysis of tephra layers in Lake Van sediments, Turkey. Applied Radiation and Isotopes 69, 929–935