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Noble gases in the sediment pore water as proxies for physical transport processes and past environmental conditions in Lake Van (Turkey)

Y. Tomonaga (1), M.S. Brennwald (1), R. Kipfer (1,2,3)

(1) Eawag, Swiss Federal Institute of Aquatic Science and Technology, Water Resources and Drinking Water, Duebendorf, Switzerland (tomonaga@eawag.ch), (2) Institute of Biogeochemistry and Pollutant Dynamics, Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, (3) Institute of Geochemistry and Petrology, Swiss Federal Institute of Technology (ETH), Zurich, Switzerland

Since many decades unconsolidated sediments have been proposed as a potential archive for noble-gas records to reconstruct past environmental conditions in lakes and oceans. In addition, the accumulation of non-atmospheric noble-gas isotopes allows tracing the geochemical origin and transport processes of the pore fluids [7]. For instance, the abundance of terrigenic He isotopes reflects the residence time and transport dynamics of the dissolved species in the pore space. The $^3\mathrm{He}/^4\mathrm{He}$ ratio of terrigenic He can be used to constrain the geochemical origin of the pore fluids [3, 7]. However, methods for reliable and robust noble-gas analysis in pore water of unconsolidated sediments have been developed only recently [1, 6].

Lake Van (Turkey) is one of the largest terminal lakes and the largest soda lake on Earth. The physical conditions of the lake are known to react sensitively to changes in the hydrological cycle and to the environment of the lake catchment [2]. Therefore, the noble-gas record in the sediments of Lake Van have a great potential as an archive to reconstruct past climate evolution in eastern Anatolia where the atmospheric south-western jet stream intersects the northern branch of the subtropical high pressure belt [4]. Also, the basin of Lake Van is situated in a tectonically active region characterized by the presence of major faults and volcanos and is known to accumulate mantle fluids [3, 7]. Noble-gas isotopes are therefore expected to yield insights into the origin and transport processes of terrigenic fluids in the sediment pore space and their release into the water body [7].

In this study we present noble-gas and salinity data measured in the pore water of sediment samples collected in Lake Van. Noble-gas data from short cores (~ 2 m) taken at different sites throughout the lake basin are discussed from the point of view of the fluid transport in the pore space. In this context, we interpret the latest results from the noble-gas samples acquired in 2010 during the ICDP PaleoVan drilling operations from 220 m long cores [4, 5]. Noble-gas measurements are further linked to salinity measurements in terms of past lake level fluctuations and physical conditions of the water body of Lake Van.

References

[1] Brennwald, M. S., Hofer, M., Peeters, F., Aeschbach-Hertig, W., Strassmann, K., Kipfer, R., and Imboden, D. M. (2003). *Analysis of dissolved noble gases in the pore water of lacustrine sediments.* Limnol. Oceanogr. Methods 1, 51–62.

[2] Kaden, H., Peeters, F., Lorke, A., Kipfer, R., Tomonaga, Y., Karabiyikoglu, M. (2010). *Impact of lake level change on deep-water renewal and oxic conditions in deep saline Lake Van, Turkey.* Water Resources Research 46, W11508.

[3] Kipfer, R., Aeschbach-Hertig, W., Baur, H., Hofer, M., Imboden, D. M., Signer, P. (1994). *Injection of mantle type helium into Lake Van (Turkey): the clue for quantifying deep water renewal.* Earth and Planetary Science Letters 125 (1-4), 357–370.

[4] Litt, T., Krastel, S., Sturm, M., Kipfer, R., Orcen, S., Heumann, G., Franz, S. O., Ulgen, U. B., Niessen, F. (2009). *'PALEOVAN', International Continental Scientific Drilling Program (ICDP): site survey results and perspectives.* Quaternary Science Reviews 28 (15-16), 1555–1567.

[5] Litt, T., Anselmetti, F., Cagatay, M. N., Kipfer, R., Krastel, S., Schmincke, H.-U., and the PaleoVan science team (2011). *A 500,000 year-long sedimentary archive drilled in Eastern Anatolia (Turkey): The PaleoVan Drilling Project.* Eos 92 (51), 477–479.

[6] Tomonaga, Y., Brennwald, M. S., Kipfer, R. (2011). *An improved method for the analysis of dissolved noble gases in the pore water of unconsolidated sediments.* Limnology and Oceanography: Methods 9, 42–49.

[7] Tomonaga, Y., Brennwald, M. S., Kipfer, R. (2011). *Spatial distribution and flux of terrigenic he dissolved in the sediment pore water of Lake Van (Turkey).* Geochimica et Cosmochimica Acta 75 (10), 2848–2864.