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Sulfate reduction and microbial abundance in saline, alkaline Lake Van (Eastern Anatolia, Turkey) – ICDP Expedition 5034

J. Kallmeyer, C. Glombitza, and PaleoVAN Scientific Party
(jens.kallmeyer@geo.uni-potsdam.de)

Lake Van is the fourth lagest terminal lake in the world. It is located on the Eastern Anatolian High Plateau (Turkey) and surrounded by two semi-active vulcanos (Nemruth Dagi and Syphan Dagi). Evaporation processes, chemical weathering of vulcanic rocks and hydrothermal activity have created an environment of extreme alkalinity (155 m eql-1, pH 9.81) and salinity (21.4 ‰ (Kempe et al., 1991). Sediments of saline and highly alkaline soda lakes, such as Lake Van, represent one of the most extreme environments on Earth (Stam et al., 2010). These sediments host extremophilic microorganisms (alkaliphiles and halophiles) that have adapted their metabolism to these peculiar environmental conditions (Oren et al., 2002)
In summer 2010 the ICDP Expedition 5034 (ICDP project PALEOVAN) retrieved long sediment cores at two sites at Lake Van, Northern Basin (5 km offshore, 245 meters below lake level, mbll) and Ahlat Ridge (12 km offshore, 357 mbll) [2]. At both sites, samples from optically undisturbed core catcher material were collected on site to investigate microbial abundance and activity. Close to both drill sites two short gravity cores (ca. 70 cm long) were retrieved to sample the sediment/water interface.
We here report the first results from microbiological investigations (porewater chemistry, cell abundance and sulfate reduction rates, SRR) in samples from the two sites at Lake Van. Although the two sites are relatively close to each other, SRR differ significantly. The sedimentary microbial ecosystem in Lake Van is apparently more sensitive to environmental conditions like water depth and sedimentation rate than marine systems. The shallower Northern Basin site exhibits significantly higher SRR than Ahlat Ridge, which is located 7 km further offshore and ∼100 m deeper. Microbial sedimentary abundance is similar at both sites, but cell abundance decreases linearly with depth, as compared to a logarithmic decrease with depth in marine sites. Due to the lack of other long lacustrine sedimentary cell abundance records, it is not clear whether these findings are unique or a common feature of lacustrine sediments.

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