Geophysical Research Abstracts
Vol. 18, EGU2016-13283, 2016
EGU General Assembly 2016

Sulfur ($^{34}S_{SO4}$) and oxygen ($^{18}O_{SO4}$) isotopic investigation of origin of dissolved sulfate at the Lake Acıgöl, Turkey

Muhittin Karaman (1), Murat Budakoğlu (1), and Suat Taşdelen (2)

(1) Geochemistry Research Group and JAL Laboratories, Department of Geological Engineering, Faculty of Mines, Istanbul Technical University(mkaraman@itu.edu.tr), (2) Department of Geological Engineering, Faculty of Engineering, Pamukkale University

A dual isotope method containing the sulfur ($^{34}S_{SO4}$) and oxygen ($^{18}O_{SO4}$) isotopic composition of dissolved sulfate (SO_4) was used for surveying SO_4 sources from lake water and springs from the Acı göl Basin. Lake Acı göl is a Na-Cl-SO_4-typehypersaline lake that is bordered by sulfate-rich springs to the south. The concentration of the dissolved sulfate of the springs ranges between 34 and 1100 mg L^{-1}, and the lake water contains an average of 22635 mg L^{-1}dissolved sulfate. The measured dissolved sulfate value of rain during the sampling season is 36 mg L^{-1}. The type of spring waters bordering the lake is Na-Ca-SO_4-Cl-HCO_3, and the others are Mg-Ca-HCO_3 and Mg-Ca-Na-SO_4-HCO_3. The $^{34}S_{SO4}$ and $^{18}O_{SO4}$ isotopic compositions were checked in 19 aqueous samples. The results showed that $\delta^{34}S_{SO4}$ values of the springs varied from -4.6 to +24.1‰ and $\delta^{18}O_{SO4}$values from +1.8 to +13.1‰Ṡulfate rich springs feeding the lake have sulfur isotopes that range between +22.1 and +24.1‰Ṡprings at the north side of the lake contain the lowest sulfur and oxygen isotope values ($\delta^{34}S_{SO4}$= -4.6‰ $\delta^{18}O_{SO4}$=+1.8‰). The maximum $\delta^{34}S_{SO4}$values are collected from borehole drilled in the western/dry part of lake area ($\delta^{34}S_{SO4}$=+32.6‰). The variations in $\delta^{34}S_{SO4}$and $\delta^{18}O_{SO4}$measuredvalues of lake water were less than 2.5‰Ṫhe $\delta^{18}O_{SO4}$ values of the lake range from +16.6‰ to +18.1‰ (mean = +17.4‰), while the $\delta^{34}S_{SO4}$ values are between +25.3 and +27.5‰ (mean = +26.6‰). The slope of the $^{18}O_{SO4}$ vs. $^{34}S_{SO4}$linear relationship (R^2=0.91, n=10) of the springs is 0.4, which indicates the sulfur isotopes increase rapidly relative to the oxygen isotopes. The linear relationship (R^2=0.64, n=9) between $^{18}O_{SO4}$ and $^{34}S_{SO4}$has a negative slope value (-0.67) for lake water. This indicates the sulfur isotopes decreases rapidly relative to the oxygen isotopes. Sulfate reduction and re-oxidation control the $^{18}O_{SO4}$ vs. $^{34}S_{SO4}$ratio in spring and lake water. The dual isotopes of the $\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$ values of dissolved sulfate discriminate that springs have three major sources of sulfate: (a) sulfate derived from only dissolution of evaporate minerals, (b) sulfate derived from combination of atmospheric deposition and dissolution of evaporate minerals, and (c) sulfate derived from oxidation of sulphide minerals. The source of the dissolved sulfate of lake water is dissolution of evaporates.

Keywords: **Hypersaline Lakes**, **Sulfur ($^{34}S_{SO4}$) and oxygen ($^{18}O_{SO4}$) isotope, dissolved sulfate**