Geophysical Research Abstracts
Vol. 20, EGU2018-12857, 2018
EGU General Assembly 2018

Heavy Metal Contamination Analysis of Bottom Sediments of Köyceğiz Lake and Fethiye - Göcek Bay, SW Turkey

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In this study, the heavy metal contamination in the base sediments of Köyceğiz Lake and Fethiye – Göcek Bay in Muğla, Turkey was assessed. The focus lies mainly on Mo, Cu, Pb, Zn, Ni, Co, Mn, Fe, As, Cr and Al metals. The applied analysis methods on the data set of 150 sediment samples (81 samples in Köyceğiz Lake and 69 samples in Fethiye – Göcek Bay) are the following: contamination analyses (contamination factor, contamination degree, modified contamination degree, enrichment factor, geo-accumulation index, pollution loading index, potential ecologic risk factor, m-ERM-Q, m-PEL-Q, toxic unit sum and proportional toxic unit), statistical analyses (correlation analysis, hierarchical cluster analysis and principal components analysis) and ordinary kriging (OK). The heavy metal concentration data set was obtained by the results of Inductively Coupled Plasma – Mass Spectrometer (ICP-MS) analysis. The main goals of the present study are to examine the heavy metal contamination degree in the study areas and to identify the possible sources. The results were analyzed by the applied statistical analyses and were supported by interpolation maps. As results of the study it can be concluded that in Köyceğiz Lake, the main possible heavy metal concentration sources are the streams which are carrying water volumes containing Al, As, Co, Cr, Cu, Fe, Pb, Ni, Mn and Zn metals into the lake. Furthermore, the highest Mo concentration was found around subaqueous and on-land hot springs which are located in the south of the lake. Besides, a high As concentration was detected around certain subaqueous cold springs in the lake. In the Fethiye – Göcek Bay, the main possible heavy metal contamination sources are the Fethiye harbour, Göcek marine and the disposal water channels of the nearby settlements. When the contamination analyses results are considered, the mean effect range median quotient method points that Köyceğiz Lake has a potential of at least 76% toxic effects on living organisms due to high Ni concentration values. The mean probable effect low quotient value shows that the lake is at the "high impacted" level. After evaluating the contamination analyses results for the entire Fethiye – Göcek Bay, the mean effect range median quotient value is at 9% toxic level on living organisms and the mean probable effect low quotient value is "moderately impacted" level according to the quality scale.

Keywords: Statistical analyses, Kriging method, ICP-MS analysis, Contamination analyses, Subaqueous hot springs.