

Biogeochemical impacts of volcanic eruptions on alkaline lakes: A case study on Lake Van in eastern Turkey

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Alkaline (soda) lakes are distributed world-wide and found nearly exclusively in volcanic regions and therefore, affected frequently by volcanic eruptions. However, the way in which the water chemistry and the primary productivity of alkaline lakes are affected by the volcanic eruptions still remains unknown. Lake Van in eastern Turkey is the largest of the alkaline lakes on Earth and had been exposed to various volcanic ash fallouts from the historical eruptions of Nemrut, Süphan and Tendürek volcanoes. Lake Van is a low-nutrient low-chlorophyll region, which makes the phytoplankton production sensitive to external nutrient input from the atmosphere. In this study, ten selected volcanic ash fallout deposits from Lake Van sediments (dating back to 82 ka) were used to determine the possible biogeochemical impacts of volcanic ash fallouts on alkaline lakes. Twenty sediment layers underlying and overlying the corresponding ten ash fallout deposits were used compare the sediment biomarker levels (pigments, alkenons, organic and inorganic carbon contents). In addition, microscopic observations of the microfossils (diatoms) in the sediments were done. Our new findings showed that volcanic eruptions can significantly impact the primary productivity either positive (fertilizing) or negative ways (toxic), while some of the eruptions caused negligible changes in the sediment biomarker contents. These different biogeochemical responses to volcanic eruptions could have arisen from the differences in the type and magnitude of the eruptions and also the initial paleoenvironmental and paleoclimatic conditions that controls the biogeochemical conditions of Lake Van during the time of volcanic eruptions.