

Environmental Consequences of Metal Concentrations in Stream Sediments of Atoyac River Basin, Central Mexico: Natural and Industrial Influences

Authors : V. C. Shruti, P. F. Rodríguez-Espinosa, D. C. Escobedo-Urías, Estefanía Martínez Tavera, M. P. Jonathan

Abstract : Atoyac River, a major south-central river flowing through the states of Puebla and Tlaxcala in Mexico is significantly impacted by the natural volcanic inputs in addition with wastewater discharges from urban, agriculture and industrial zones. In the present study, core samples were collected from R. Atoyac and analyzed for sediment granularity, major (Al, Fe, Ca, Mg, K, P and S) and trace elemental concentrations (Ba, Cr, Cd, Mn, Pb, Sr, V, Zn, Zr). The textural studies reveal that the sediments are mostly sand sized particles exceeding 99% and with very few to no presence of mud fractions. It is observed that most of the metals like (avg: all values in $\mu\text{g g}^{-1}$) Ca (35,528), Mg (10,789), K (7453), S (1394), Ba (203), Cr (30), Cd (4), Pb (11), Sr (435), Zn (76) and Zr (88) are enriched throughout the sediments mainly sourced from volcanic inputs, source rock composition of Atoyac River basin and industrial influences from the Puebla city region. Contamination indices, such as anthropogenic factor (AF), enrichment factor (EF) and geoaccumulation index (I_{geo}), were used to investigate the level of contamination and toxicity as well as quantitatively assess the influences of human activities on metal concentrations. The AF values (>1) for Ba, Ca, Mg, Na, K, P and S suggested volcanic inputs from the study region, where as Cd and Zn are attributed to the impacts of industrial inputs in this zone. The EF and I_{geo} values revealed an extreme enrichment of S and Cd. The ecological risks were evaluated using potential ecological risk index (RI) and the results indicate that the metals Cd and V pose a major hazard for the biological community.

Keywords : Atoyac River, contamination indices, metal concentrations, Mexico, textural studies

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020