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Geochemistry of surficial sediments at shallow submarine hydrothermal vent in Mapachitos, Bahía Concepción, western Gulf of California

Maria Luisa Leal-Acosta, Evgueni Shumilin, and Nicolai Mirlean

Centro Interdisciplinario de Ciencias Marinas, Av. IPN s/n Col. Playa Palo de Santa Rita, La Paz, B.C.S., MéxicoMexico ((52+612) 122-53-22 /maluleal40@yahoo.com.mx)

With the objective to know the influence of shallow hydrothermal vents located in Mapachitos, Bahía Concepción, western coast of central Baja California Peninsula, the geochemistry of surficial sediments of the adjacent zone has been studied. The bulk concentrations of Al, Ba, Ca, Cd, Co, Cs, Cu, Fe, Li, Mn, Mo, Ni, Rb, Ti, U, V y Zn in the dried and homogenized sediments were measured by ICP –AES and ICP-MS after the digestion by a hot mixture of four concentrated strong acids (HClO4, HNO3, HCl and HF). Arsenic and Hg were measured by atomic absorption spectrophotometry after soft digestion and generation of hydrides of As or elemental Hg respectively. The content of organic and inorganic carbon also was measured. The calculated CaCO3 values in the sediments of the polygon showed until 90% in some areas (61 % in average). The content of organic carbon in the most of sediments was such low as 1%. The total element concentrations in the sediments were compared with earth′s crust average abundances and enrichment factors (EFs) were calculated using Al as normalizing element. High values of As (207 mg kg-1) and Hg (143062 μg kg-1) were found in sediments of the hydrothermal site. Elevated values for these potentially toxic elements of hydrothermal origin and some others elements from marine biogenic sources were registered in the surface sediments of the adjacent area of the bay. The average concentrations of As (3.1 mg kg-1), Cd (0.98 mg kg-1), Hg (52 μg kg-1) and Ca (28.3%) are above their earth's crust average values (highly enriched according to their EFs). These results confirm than certain hydrothermal influence on the sediments exists near hydrothermal vents, mainly for As and Hg. Other elements are conservative (Ba, Co, Cs, Cu, Fe, Li, Mn, Ni, Rb, Ti, U, V and Zn) showing the EF values close to the unity. The principal component analysis allows to determine three factors that explain 91% of variance, as well as to differentiate some associations as calcareous components, redox-sensitive elements, terrigenous elements and elements from the hydrothermal source.