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Composition of Settling Particulate Matter and Element Fluxes Into Alfonso Basin, La Paz Bay, Gulf of California: 2002-2008 Sediment Trap Time Series

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In order to understand the Earth system we need to study each one of its spheres, as well as establish the interactions between them. Modern geochemistry does not only study the element contents in separated parts of this system (lithosphere, biosphere, hydrosphere, cryosphere and atmosphere). It focuses on the characterization of biogeochemical cycles of elements. The creation of these cycles requires the quantification of fluxes between the ecosystem compartments. Important features to consider in the marine environment are represented by vertical fluxes of settling particulate matter (SPM) and the elements transported to the bottom sediments. These fluxes depend on the composition and amount of sedimentary particles that form in the upper layer of the aqueous reservoir, their transformations in the water column, as well as their final deposition at the bottom. The main interest of this work is to study the SPM composition and the particulate element fluxes to the La Paz Bay and try to find their possible contribution sources. The study area, La Paz Bay, is located in the southern part of the Baja California Peninsula. This embayment has a variable depth, ranging from less than 200 m beneath most of the bay to a maximum depth of 410 m in a tectonic depression called Alfonso Basin. An important characteristic of the study area is the desertic arid climate with very low precipitation ($<$ 200 mm/yr), occurring mainly during the passage of tropical cyclones, as well as a high probability of dust storms. Settling particulate matter was collected during 2002-2009 with a periodicity of 7-15 days. Major and trace elements were determined using instrumental neutron activation analysis. The present study partially includes the 2002-2005 database (Rodríguez Castañeda, 2008). At the present moment we can conclude that the total mass flux, composition and different element fluxes show a high variability and do not exactly coincide with each other. However, some element behavior seems to be influenced by different extraordinary events. Tropical cyclone effect on SPM, specially noted for Ignacio (22-27 August, 2003), Marty (18-14 September, 2003) and Henriette (30 August - 6 September, 2007) hurricanes, was found for Sc and Fe, representing the fluvial terrigenous supply. Reported planktonic blooms for the study area, especially on June and July of 2002 and December of 2007, were affecting Ca, Ba, U contents and fluxes, defining the marine biogenic supply. Dust storm effect was found for Sc, Fe and As, being related to aeolian supply due to strong northeast winds, acting mostly on fall-winter in the study area. And finally, suboxic conditions of the water column of the La Paz Bay could be creating authigenic particles, due to the form change of redox-sensitive elements, reducing from dissolved to particulate phase, as could be the case for U and As. Some elements did not show a relation to only one phenomena but several of them. So in consequence these might be controlled by a combination of processes and interactions.