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Geochemical and hydrodynamic control of trace element transport in a reservoir: impact of interflow layer

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Abstract

Concentration of trace elements both in the water column (dissolved phase and acid-soluble suspended particles) and in sediments (bulk and acid-soluble particles) was followed for one year in a water reservoir (the Bicaz reservoir) used for electricity production. This study investigated the impact of river inflows, outflows and the position of the outflow for the cycling and the transport of these elements along this water reservoir. Time series results reveal that river inflow supplies mainly reducing waters. In the water column, the stable Al/Fe ratio (from 0.8 to 1.5) recorded in acid-soluble suspended particles suggests the formation of similar amorphous phases during the year, phases that could be stabilized by organic ligands. In sediments, these amorphous phases are no more recorded. In the water column, some trace elements are strongly associated with Al-Fe amorphous phases (Rb, Cs, Co, Cu, Zn, Pb, Th); others are independent (Sr, Sn, As, Sb, U). In sediments, Co, Y, Zn, Ga, Cr, Ni, V, Rb, and Ba are associated with phases containing Fe, Al, K, Mg, P and Ti. The reservoir acts as a moderate sink for Fe, V, Cr, Co, Cu; it acts alternately as a sink and a source for Zn. Among the elements studied, only Mn and Ni are significantly stored. Rb shows particular affinity for Fe oxide which is not recorded in literature. Our results show the importance of the outflow depth on the transport of trace elements within a reservoir.

Keywords: reservoir, Al-Fe particles, trace elements, redox condition, interflow layer, water column, sediments.

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