

PASSERA Lucas (2020) : Metal transport in the Chamberonne basin – focus on suspended solids

Population growth in Switzerland has led to increasing pressure on urban and semi-urban watersheds. Several organic and non-organic pollutants with different origins have been monitored in such catchments and constitute a threat to biodiversity. The Chamberonne river (Switzerland, VD) was investigated in this work. Among all the contaminants having an influence on its quality, metals were chosen to be analyzed. Indeed, their potential toxicity at very low concentrations and non-degradability under natural conditions makes them particularly important to consider. The analysis focuses on suspended solids, as they are suspected of being responsible of transporting a great deal of pollutants having more affinity with minerals than with water. Variables describing the metal load, suspended particle's size and surrounding organic compounds were assessed featuring ICPOES, laser diffraction particle size analysis, UV-Visible spectroscopy and spectrofluorimetry.

The results revealed the presence of considerable amounts of metals (Al, Fe, Cd, Cu, Cr, Mn, Ni, Pb, Ti and Zn) in the suspended solids, which are essentially constituted of clay and fine silt (< 16 µm) most capable of adsorbing metals. Also, principle component analysis (PCA) could successfully discriminate geogenic elements from anthropogenic ones and the first flush effect characterizing their arrival into the catchment was well observed. Unfortunately, the data relative to the optical characterization of dissolved organic matter could not be exploited in a dynamic time-dependent way. However, it could help hypothesize that a non-aromatic pool of dissolved organic matter could explain the observed strong affinity of metals towards the solid phase.

In the more global context of the metal enrichment of the downstream bay's sediments, the Chamberonne could be described as a considerable contributor next to the wastewater treatment plant (WWTP). Nevertheless, in order to comprehensively describe metal transport from the land to the lake, further work is needed on the dissolved fraction of metals, the organic load of suspended solids and the fate of metals in WWTP's.

Keywords: Suspended solids, heavy metals, transport, lake sediments, urban catchment, geochemistry.