Temporal variation of suspended sediment dynamics and river multi-contamination fluxes in an urbanized catchment

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The excessive supply of contaminants from urban areas during the last centuries has led to deleterious impacts on aquatic ecosystems. The behavior and dynamics of these contaminants and the bearing-particles has to be better understood in order to reduce water quality deterioration. Accordingly, the current research investigated the multicontamination of the 900-km² Orge River catchment (Seine basin, France) characterized by a contrasted land use (i.e. forest, agricultural and urban) and an increasing urban pressure between headwaters and the outlet. Geochemistry analysis on both particulate and dissolved phase, and fallout radionuclides on particulate phase were thus performed on river samples collected during a hydrological year at four stations representing the urbanization gradient. Urban impact was evidenced by an increase in recently eroded particles supply shown by radionuclide measurements, and by a rise in particulate contamination (Cu, Zn, Sb, Pb) and dissolved contamination (Cu, Zn, NO_3, SO_4). Moreover, hydrological conditions appeared to influence particles dynamic and contaminant fluxes. A greater contribution of recent particles originating from urban areas was always observed except during seasonal flooding showing a significant increase in agricultural particulate input from upstream rural sites. Additionally, mass balance of particulate contamination fluxes showed the lowest supply of contaminants from urban areas during low water flow periods in summer and the highest in winter periods. Conversely to particulate phase, dissolved phase contamination provided by the downstream part of the catchment appeared to be stable over all hydrological conditions, suggesting a continuous supply from urban areas. These results outline the need to study both the contaminant fluxes and the particle fluxes to efficiently improve urban river water quality.