

# **An estimation of the microplastic flux during a major sediment management operation on the Upper Rhône River (France)**

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The transport and sedimentation of microplastics (MP) in hydrosystems are still poorly explored. In highly engineered rivers such as the Rhône River, sediment management operations are regularly implemented to evacuate sediments accumulated behind the dams. In the upper Rhône, these major operations consist in a partial lowering of the Verbois dam (Switzerland) followed by the other 6 dams downstream to support the sediment transit. As already demonstrated for hydrological events such as floods (Gündoğdu et al. 2018; Treilles et al. 2022), we postulate that this sediment flushing operation has a significant importance in the transport of MP.

To estimate the microplastics quantities transported during this operation, a two-week sampling campaign at one monitoring site has been conducted in 2021. In order to precise where the microplastic transport is the most effective in a section of the riverbed, bottom load sediments and suspended matter in the water column were both sampled. To finally evaluate the microplastic fluxes, the microplastic concentrations found were linked with hydro-sedimentary data also monitored during the operation.

Extraction of microplastics from the samples was done by densimetric separation and degradation of the organic matter with hydrogen peroxide. The extraction protocol was realized in controlled laboratory conditions to limit contamination. The identification and analysis of the microplastics was done by Fourier-transform infrared spectroscopy (FTIR) and with the siMPlE software. The final concentration was given in particule and mass per kilogram of dry sediment.

Microplastics sizes revealed to be larger in the bottom load than in the suspended load. The main types of microplastics found in the samples were polyethylene (PE) and polypropylene (PP). The amount of microplastics that have passed through the bottom load sediments was much lower (< 1 % of the flux) than the one that have passed through the water column. In total, almost 500 tonnes of microplastics passed through during the eleven days of the sediment management operation. This result is comparable to the annual flow of microplastics that have passed through a reach of the Seine river downstream from Paris (924 - 1675 tonnes) estimated by Treilles et al. (2022).