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COMBINATION OF PASSIVE SAMPLERS TO MONITOR THE CHEMICAL STATUS OF 6 FRENCH RIVERS

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ABSTRACT

The Water Framework Directive (2000/60/EC) requires member states to achieve good ecological and chemical status for all water bodies by now or to a possible extended deadline in 2027. The monitoring of water quality is based on several grab samples per year analysed for priority contaminants and selected compounds. However grab sampling has several shortcomings such as undetected compounds due to trace level concentrations, matrix interferences and lack of temporal representativeness. Passive sampling techniques were designed to overcome some of these drawbacks and have demonstrated high benefits to assess the chemical status of water bodies for a wide range of contaminants. The aim of our study was to deploy simultaneously 3 types of passive samplers to assess the contamination of 6 French rivers (1 station per river) influenced by agriculture, former-mining, urban and/or industrial activities. We report the results of a one month in-situ exposure of Diffusive Gradient in Thin film technique samplers (DGT), passive Stir Bar Sorptive Extraction samplers (pSBSE) and Polar Organic Chemical Integrative Samplers (POCIS), designed to target 8 trace metals, 26 pesticides and 31 pharmaceutical drugs. The number of quantified compounds and the levels of time-weighted average concentrations obtained allowed assessing the anthropogenic chemical pressures on surface waters. We quantified target trace metals, pesticides and pharmaceuticals in all rivers, even at low concentrations in the expected unpolluted reference river. We could identify the influence of industrial activities (high concentration of former-mining residue: e.g. zinc), agriculture (herbicides: e.g. chlortoluron), vineyard practices (fungicide: e.g. copper) and waste-water effluents inputs (pharmaceuticals: e.g. carbamazepine). Finally, a global pattern of contamination was drawn for each river inferred from passive sampling results. In conclusion, this work enabled discussing the advantages and the shortcomings of such a sampling strategy and the potential contribution of passive sampling tools to the water monitoring of contaminants.