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Micropollutants and boron isotopes as tracers of domestic wastewater effluents in surface and groundwaters

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Surface water and groundwater contamination by a chemical element or molecule may have several origins. For instance, AMPA can originate from agricultural practices as a degradation product of glyphosate, but also from wastewater effluents as a degradation product of phosphonates. The discrimination of the origins and vectors of contamination in the environment is both an environmental and a societal issue, and is required to define integrated water resources management at the catchment or water body scale by implementing appropriate measures to effectively struggle against pollution. The objective of this study is to define a methodology to identify a "domestic wastewater" component within surface waters and groundwater. As there is no ideal tracer, i.e. conservative, persistent in water compartments, present in quantity above the detection limit and originating from a single type of pollution source, we propose a multi-tracer approach (chemical and isotopic) to identify and validate the relevance of foreseen tracers, in order to overcome this limitation. Among the relevant tracers of wastewater, some may be used for their intrinsic or combined discriminant power: i.e. Tracer of detergents: boron concentration and isotopes; Pharmaceuticals tracers: e.g. carbamazepine, ibuprofen, gadolinium anomaly; Life-style tracers: e.g. caffeine, sweeteners.

The studied catchment is impacted both by diffuse agricultural pollution and punctual wastewater inputs from small capacities wastewater treatment plants without tertiary treatment process, representative of rural areas. Potential combination of suitable tracers is discussed combining various micropollutants and isotopic signatures.