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# Coupling geochemistry, environmental isotopes and organic pollutants to improve the understanding of anthropized coastal groundwater dependent hydrosystems

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Coastal aquifers can be considered as an important socio-economic and ecological component worldwide. The important urbanization of coastal areas induces a strong pressure on groundwater resources. In consequence, their qualitative and quantitative degradation can be problematic for both human activities and coastal groundwater dependant ecosystems. For establish sustainable management policies, characterizing the behaviour of these highly anthropized hydrosystems is essential to identify the sources of pollution.
In this study, an original approach is proposed by coupling geochemical and isotopic (18O, 2H, 3H, 15N) tracers and organic pollutants (51 pollutants analysed). This methodology was applied to a Mediterranean coastal hydrosystem, in connection with a coastal lagoon (Corsica Island, France). Sampling campaigns in ground, surface, lagoon and untreated waste water were carried out in April and September 2015 and in May 2016.
The isotopic signatures allow identifying the recharge areas and a differentiation of the recharge with a double origin: autochthonous (coastal alluvial rainfall) and allochthonous (mountainous in the island inner). Then, isotopic and geochemical data permit to distinguish the end-members, to quantify the mixing processes into the aquifer and to highlight the groundwater dependence of the nearby coastal wetland. The heterogeneous residence time of groundwater, showing by 3H, permit to characterize the inertial areas, with long residence time, and vulnerable areas with a strong infiltration of recent water. Integration of $NO_3$- concentrations and water-residence time data revealed a progressive accumulation of pollutants... The current low groundwater quality is mainly due to a legacy pollution coming from land-use practices several decades ago. Finally, organic pollutants display the aquifer vulnerability to sewage pollution. In addition, the organic compounds also allow to precise the fast lateral and/or vertical infiltration processes. Thanks to their own physical and chemical properties, which control their fate in the environment, organic compounds provides a higher level of resolution. Therefore, this multi- tracer approach helps to improve a conceptual model of highly anthropized hydrosystems in taking into account water-rock interactions, mixing processes, recharge and contamination modalities.