Numerical modelling: a tool for Managed Aquifer Recharge and Soil Aquifer Treatment system in coastal area.

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Managed aquifer recharge (MAR) combined to soil aquifer treatment (SAT) is one of the most efficient and affordable strategies to recycle treated wastewater to increase drinking water supplies as an indirect potable reuse practice (IPR). The MAR-SAT implies natural attenuation for contaminants of environmental concerns (CECs) contained in treated wastewater, hence protecting groundwater quality. However, unknowns remain concerning mechanisms controlling fate of CECs in MAR-SAT system, preventing to maximize its removal efficiency to preserve ecosystem services and human health.

Thanks to the JPI EVIBAN project, we will design an operational tool to predict water quality considering MAR-SAT system of Agon-Countainville (Normandy, France) in a natural coastal hydrosystem. This tool will combine the flow and reactive transport modelling (based on the MARTHE-PHREEQC codes) accounting for multi physical and chemical processes controlling fate of the CECs such as microbial degradation, adsorption, gas diffusion, aerobic respiration, nitrification and transition of redox states. This tool will be used to simulate a set of parameters (salinity, temperature, chemistry and CECs) already monitored on the treated wastewater and groundwater since 2016 in this MAR-SAT system. Additional experimental approaches will be further developed for supporting the modelling robustness. The future results given by the tool will provide knowledge on the integrated sustainability of this MAR-SAT system. Furthermore, this innovative tool could also be used to highlight the benefits of improved combinations of natural and engineered components for optimized water management of MAR-SAT systems.