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Transfer of Trace Organic Compounds in the Soil Aquifer Treatment system of Agon-Coutainville (France).

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In order to avoid threatening seashore economical activities from direct discharge of secondary-treated wastewater (STWW) into the sea, Soil Aquifer Treatment (SAT) is used in the wastewater treatment plant of Agon-Coutainville (Normandy, France) as an additional treatment step since 2005. STWW is infiltrated into a sandy aquifer through three reed beds. Only one of the three ponds is flooded by STWW rotating every four months. Recent monitoring including Traces Organics Compounds (TrOCs) highlight a very significant reduction of TrOCs concentrations in the groundwater (Picot-Colbeaux et al., 2020). However, the nature and the magnitude of the mechanisms, either geochemical processes and/or dilution, are not clearly understood.

An experiment is set up to highlight the nature and the magnitude of the processes involved in TrOCs mitigation as well as the efficiency of the SAT by determining residence time. The experiment started at the beginning of the infiltration pond flooded with STWW at an average flow rate of 780m³/d. A pumping ensured hydraulic gradient to one piezometer located at 35 meters of the main discharge point where the sampling of groundwater is carried out.

STWW and groundwater are monitored (water level, pH, Eh, salinity and analyses of major ions and trace elements including TrOCs) during 34 days of experiment. Specific targeted TrOCs are carbamazepine and oxazepam.

The mean initial chloride concentration in groundwater was 182 mg/l whereas the STWW concentration was 555mg/l. During experiment, chloride concentrations in groundwater showed a fast increase between 8 and 13 days reaching a plateau at the initial STWW concentration.

Oxazepam and carbamazepine concentrations were initially low in groundwater (120 ng/l and 170 ng/l, respectively) in regards to STWW (2000 ng/l and 800 ng/l respectively). A slow increase of TrOCs concentration in groundwater is observed after more than 13 days of infiltration reaching a maximum concentration depending on TrOCs. For all these contaminant, concentrations ratios ($C_{\text{groundwater}}/C_{\text{STWW}}$) remained below 1 until the end of the experiment. For oxazepam and carbamazepine, the maximum concentrations (715 ng/l and 425 ng/l, respectively) were reached in the groundwater at the end of the experiment.

The results indicate 1) slight or no dilution of infiltrated waters with regional groundwater and 2) an estimated mean residence time between 8 and 13 days from the infiltration point to the observation well and 3) degradation and/or sorption processes driving TrOCs mitigation.