

Benthic nitrite fluxes in the Seine River (France): Insights from early diagenetic modeling

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Elevated concentrations of nitrite have been observed in the Seine River, raising concerns about possible toxic effects. In this study, we investigate the role of bottom sediments as potential sources or sinks of nitrite along the river continuum. Sediment cores were collected from two depocenters, one located upstream, the other downstream, from the largest wastewater treatment plant (WWTP) of the Paris conurbation. Pore water profiles of oxygen, nitrate, nitrite and ammonium were measured. Ammonium, nitrate and nitrite fluxes across the sediment-water interface were determined in core incubation experiments. The data were interpreted with a one-dimensional, multi-component reactive transport model, which accounts for the production and consumption of nitrite through nitrification, denitrification, anammox and dissimilatory nitrate reduction to ammonium (DNRA). Nitrate uptake by the sediments was observed in all core incubations. In contrast, sediments were found to act as either a source or a sink of nitrite (and ammonium) depending on whether oxygen was present or not in the bottom water. Sensitivity analyses indicate that benthic nitrite fluxes are strongly influenced by bottom water oxygen and nitrate concentrations, and by the deposition flux of organic matter. According to the results, the WWTP is the major source of nitrite to the Seine river, while river sediments are only a minor source.