Role of very common artificial ponds on nitrogen behavior in the critical zone of agricultural areas (South-West of France)

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In agricultural areas, contamination of nitrogen and its transfer downstream jeopardizes the environment. Numerous artificial ponds have been constructed in SW France particularly to supply crop irrigation demand in agricultural areas, but their role in the transfer and transformation of nitrogen has not been evaluated at a catchment scale. Particularly, the link between denitrification process in accumulated sediments and the pond management and other environmental factors, is not well known. The study aims to evaluate the nitrogen pattern along the channel and quantify the PDR in sediments, and figure out the driving factors favoring the nitrate mitigation in streamwater.

Water and benthic sediment were sampled upstream, downstream and inside 4 ponds, in a downstream direction (March 2016) of two catchments (Marestaing (MCZ) and Auradé Critical Zone (ACZ)), sharing similar environment and land use. The potential denitrification rate (PDR) in sediments and other physicochemical parameters were measured.

MCZ and ACZ exhibits a decreasing upstream-downstream trend of nitrates in waters (80 and 50%, respectively). This decrease can result from the dilution due to increasing discharge in ACZ (nitrate flux was increased by 4). On the opposite, the discharge in MCZ was lower downstream and the nitrate flux reduced by 7. At the pond scale, the nitrate abatement is significant whatever the pond (as an average >27±28%), but the efficiency is variable and it is more substantial in MCZ in agreement with higher PDRs. Though two catchments shared similar geographical features and land use, PDRs in two areas exhibited different correlations to physico-chemical parameters. This may result from not only the hydraulic condition but other environmental factors (the size, age of ponds, the dredging activity, etc.). Further investigations, particularly hydraulic dynamic and water retention time, will be performed to study their links to PDR and to evaluate the role of the cumulative ponds on the nitrogen dynamics at the catchment scale.