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Towards a European denitrification concept for improved groundwater quality management and chemical status assessment

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Denitrification potential is an important parameter to know for adequate and efficient management and assessment of groundwater vulnerability and chemical status. Denitrification removes nitrate in groundwater, but the denitrification capacity is highly variable in space and time, and it may be used up with time. When linking pressure and impact the effect of partial or complete denitrification and denitrification capacity should be taken into account. In some areas, denitrification is seen as an advantage, allowing higher N release below soil without leading to a decrease of the groundwater quality and eventually concentrations in groundwater higher than the WFD and DWD threshold values, which EU member states have to establish to protect drinking water and groundwater dependent terrestrial and associated aquatic ecosystems.

Within the GEOERA HOVER project, the aim was to assess the spatial extent and importance of denitrification. The studied cases permitted at a first step to highlight the heterogeneities of the approaches due to the variability of information obtained i.e. the likelihood of denitrification, depth and thickness of redox transition zone, complete denitrification status. The parameters used to define the denitrification vary also from one country to another based on a large set of redox sensitive ions (Eh, O₂, NO₃, NO₂, Fe, Mn, SO₄, CH₄, $\delta^{18}\text{O}_{\text{-NO}_3}$ et $\delta^{15}\text{N}_{\text{-NO}_3}$, H₂S or N₂). Some of these parameters can be accessed by standard methods in most laboratories, used for groundwater quality monitoring, while others require specialized analysis and interpretations.

Considering groundwater and hydrogeological data available in most of the EU countries, a simple method is proposed in order to classify the monitoring points into three classes: oxic, anoxic and mixed. After being tested in different well-known areas the method will be applied in various lithologies and hydrogeological contexts The proposed method will enable the development of European maps supporting groundwater quality management across Europe.