



Occurrence of greenhouse gases (CO₂, N₂O and CH₄) in groundwater of the Walloon Region (Belgium).

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Greenhouse gases (GHGs) are an environmental problem because their concentrations in the atmosphere have continuously risen since the industrial revolution. They can be indirectly transferred to the atmosphere through groundwater discharge into surface water bodies such as rivers. However, their occurrence is poorly evaluated in groundwater. The aim of this work is to identify the hydrogeological contexts (e.g., chalk and limestone aquifers) and the most conducive conditions for the generation of GHGs in groundwater at a regional scale. To this end, carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) concentrations, major and minor elements and environmental isotopes were monitored in several groundwater bodies of the Walloon Region (Belgium) from September 2014 to June 2016. The concentrations of GHGs in groundwater ranged from 1769 to 100519 ppm for the partial pressure of CO₂ and from 0 to 1064 nmol/L and 1 to 37062 nmol/L for CH₄ and N₂O respectively. Overall, groundwater was supersaturated in GHGs with respect to atmospheric equilibrium, suggesting that groundwater contribute to the atmospheric GHGs budget. Prior inspection of the data suggested that N₂O in groundwater can be produced by denitrification and nitrification. The most suitable conditions for the accumulation of N₂O are promoted by intermediate dissolved oxygen concentrations (2.5-3 mg L⁻¹) and the availability of nitrate (NO₃⁻). These observations will be compared with the isotopes of NO₃⁻. CH₄ was less detected and at lower concentration than N₂O, suggesting that groundwater redox conditions are not reducing enough to promoted the production of CH₄. The results will be presented and discussed in detail in the presentation.