

## Isotopic fractionation of nitrate by benthic microbial communities

ANNIET M LAVERMAN<sup>1</sup>\* VERONIQUE VAURY<sup>2</sup> MATHIEU SEBILO<sup>2</sup>

<sup>1</sup>UMR 6553 ECOBIO, Rennes 1, France (\*correspondence [anniet.laverman@univ-rennes1.fr](mailto:anniet.laverman@univ-rennes1.fr))

<sup>2</sup> IEES, Sorbonne Université, France

Nitrate reduction in aquatic sediments mitigates high input of inorganic nitrogen due to anthropogenic pollution. This microbially mediated nitrate reduction results in a fractionation of N, i.e. the enrichment of <sup>15</sup>N of the remaining NO<sub>3</sub><sup>-</sup>. Ideally the increase of δ<sup>15</sup>N-NO<sub>3</sub><sup>-</sup> of nitrate could be used as an indicator of nitrate reduction. Nitrogen isotope fractionation factors (ε<sup>15</sup>N) obtained for denitrification have been determined in a wide range of environments resulting in a large span of values varying from -2 to -30 ‰ for pure cultures and between 0 to -20 ‰ in aquatic sediments. In the current study we used a flow through reactor system using intact sediment slices; determining nitrate reduction rates carried out by the autochthonous benthic nitrate reducing communities. Rates were obtained under non-limiting nitrate concentrations, with the natural organic carbon and no diffusion of nitrogen from the water-sediment interface. Nitrate reduction rates and the associated ε<sup>15</sup>N were determined in different types of aquatic sediments (river, mangrove, intertidal mudflats) to cover different environmental variables (e.g. available organic carbon, nitrate reducing communities). Nitrate reduction rates ranged from 70 to 300 nmol NO<sub>3</sub><sup>-</sup> cm<sup>-3</sup> h<sup>-1</sup> with ε<sup>15</sup>N values varying between -11 to -31‰ for the different types of sediment. The isotope fractionation factors were in the upper range of values previously reported in the literature and should be considered regarding the interpretation of <sup>15</sup>N-NO<sub>3</sub><sup>-</sup> measurements.