



## **Macrofaunal irrigation traits enhance predictability of biogeochemical cycling**

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Trait based indices constitute a versatile tool for the prediction of ecosystem functioning over large spatial scales and represent a promising approach to meet societal, political and regulatory demands. Here we investigate for the first time the ability of different trait based indices to predict nutrient fluxes of ammonium, nitrate, nitrite, silicate and phosphate under different environmental conditions. We hypothesize that irrigation traits, as applied in the newly proposed index “Community Irrigation Potential” (IPc), will increase the predictability of macrofaunal impact on nutrient fluxes compared to commonly used sediment reworking traits, as in the index “Community Bioturbation Potential” BPc. We correlate IPc and BPc with experimental nutrient flux data measured under different environmental conditions. Both trait based indices and environmental conditions significantly affected all analysed nutrient fluxes. We therefore conclude that neither the trait based indices nor the environmental conditions suffice for quantitative modelling of sediment biogeochemical turnover. Accordingly, information on of macrofaunal activity is needed to reliably predict biogeochemical turnover. Our results further demonstrate that generally nutrient fluxes of ammonium, nitrate, nitrite, silicate and phosphate are more closely linked to irrigation traits than to sediment reworking traits. In conclusion, linking macrofaunal bioirrigation to important environmental factors such as permeability, changing nutrient gradients in the water column and organic matter concentrations may strongly enhance performance of ecosystem models.