



Global estimates of enhanced solute transport in marine sediments

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ABSTRACT: Pore-water solute transport processes acting in addition to molecular diffusion affect sediment biogeochemistry and benthic exchange fluxes. Given the relatively few direct measurements of enhanced transport intensities, there is a need for predictive relationships to calculate enhanced transport parameters from more readily available information. Here, enhanced diffusion coefficients and nonlocal mass transfer coefficients are obtained by comparing total and molecular diffusion fluxes of oxygen across the sediment-water interface. Semiempirical relationships for these coefficients are derived as functions of benthic oxygen uptake. According to these relationships, enhanced solute transport significantly affects sediment-water column exchanges in regions with large benthic oxygen fluxes, typically on the continental shelves. On a global scale, enhanced transport contributes approximately one third of the total benthic flux of oxygen and more than half of that of phosphate.

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