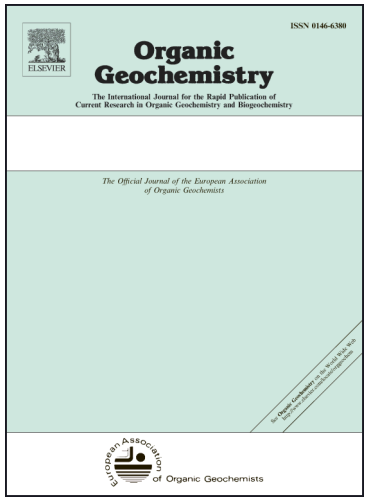

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Photochemical dissolution of organic matter from resuspended sediments: Impact of source and diagenetic state on photorelease

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ABSTRACT

Sediments exposed to simulated solar radiation release dissolved organic carbon (DOC). However, it is unclear how the provenance of sedimentary organic matter (OM) impacts this photorelease. In the first geographically extensive study of this kind, twenty three size fractionated, fine grained sediments (< ca. 10 to 20 μm) from a variety of drainage basins were resuspended (at suspended solid loading of 29 to 255 mg/l) and exhibited a net photochemical DOC release ranging from 2 to 178 μmol/g/h. There was a logarithmic increase in photoreleased DOC vs. the proportion of sedimentary organic carbon (%OC), most likely resulting from photon limitation at high sedimentary OC loading (i.e. high mass-specific absorption limiting light penetration). Sediment source and quality, as revealed by biomarkers, had a significant effect on DOC photorelease. The fatty acid terrestrial aquatic ratio (TAR_{FA}) indicated that terrestrially derived sediments exhibited relatively greater DOC photorelease. The long chain carbon preference index (CPI_{24-34}) indicated that diagenetically unaltered terrestrial OM photoreleased more DOC than diagenetically altered terrestrial OM. The short chain carbon preference index (CPI_{14-22}) demonstrated that sediments containing diagenetically altered planktonic or algal derived OM had a greater photorelease rate of DOC than fresh algal OM. This suggests that humic substances (humus and/or adsorbed humic and fulvic acids) play an important role in the photochemical dissolution of OC regardless of whether or not they are imported from upstream (i.e. terrestrial humics) or generated within the depositional or sedimentary environment (i.e. humification of algal dissolved OM).