The spectral slope coefficient of chromophoric dissolved organic matter ($S_{275-295}$) as a tracer of terrigenous dissolved organic carbon in river-influenced ocean margins

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Limnol. Oceanogr., 57(5), 2012, 1453-1466 | DOI: 10.4319/lo.2012.57.5.1453

ABSTRACT: The present study demonstrates that the spectral slope coefficient of chromophoric dissolved organic matter (CDOM) between 275 nm and 295 nm ($S_{275-295}$) can be used as a tracer of the percent terrigenous dissolved organic carbon (%tDOC) in river-influenced ocean margins, where rivers exert an important control on carbon dynamics and CO_2 fluxes. Absorption coefficients of CDOM and concentrations of dissolved organic carbon (DOC) and dissolved lignin were measured on a seasonal basis in the Mississippi and Atchafalaya rivers and in surface waters of the northern Gulf of Mexico (NGoM). A strong, linear relationship between lignin concentrations and CDOM absorption coefficients indicated lignin is an important chromophore in this environment. The dual nature of lignin as an important chromophore in CDOM and as a terrigenous component of DOC facilitated development of the tracer. The applicability of the tracer relies on the existence of a strong, nonlinear relationship between $S_{275-295}$ and the DOC-normalized lignin yield in rivers and along the freshwater – marine continuum in the NGoM. Physical mixing and the effects of photodegradation on $S_{275-295}$ and dissolved lignin were largely responsible for maintaining this relationship, suggesting the tracer is applicable to surface waters of most river-influenced ocean margins. The spectral slope coefficient ($S_{275-295}$) provides new capabilities to trace tDOC on synoptic scales of relevance to ocean margins and represents an important tool for improving ocean carbon budgets.