Floodplain influence on dissolved organic matter composition and export from the Mississippi – Atchafalaya River system to the Gulf of Mexico

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Limnol. Oceanogr., 57(4), 2012, 1149-1160 | DOI: 10.4319/lo.2012.57.4.1149

ABSTRACT: Comparisons of the concentrations and compositions of dissolved organic matter (DOM) between the lower Mississippi River (MR) and its distributary, the Atchafalaya River (AR), indicated a strong influence of floodplains on DOM in the AR. Concentrations of dissolved organic carbon (DOC), lignin phenols, amino acids, neutral sugars, and chromophoric DOM (CDOM) absorption coefficients were higher in the AR than in the MR. Significantly lower syringyl to vanillyl phenol ratios (S : V) in the AR indicated substantial contributions from gymnosperms (e.g., *Taxodium distichum*). The lowest S : V values in the AR were measured during maximal litterfall in October-November when yields of lignin phenols were highest. Lower spectral slope coefficients ($S_{275-295}$) in the AR were indicative of relatively high-molecular-weight CDOM. Yields and compositions of amino acids and neutral sugars indicated DOM in the AR was more bioavailable than in the MR. Nitrogen removal in the floodplain was in part responsible for the significantly lower concentrations of total dissolved nitrogen (TDN) in the AR. Seasonal variability in DOM composition was greater in the AR. About 35% of the DOC and > 44% of the lignin phenols, amino acids, and neutral sugars exported from the Mississippi-Atchafalaya River system was carried by the AR, thereby revealing the important role of the AR in DOM export from the river system. DOC export from rivers was predominantly controlled by water discharge. The long-term (1996-2010) average DOC export from the Mississippi-Atchafalaya River system was 2.70 Tg yr^{-1} (MR: 1.75 Tg yr^{-1}; AR: 0.95 Tg yr^{-1}), accounting for 0.8-1.1% of global riverine DOC export.