Effect of seasonal sediment storage in the lower Mississippi River on the flux of reactive particulate phosphorus to the Gulf of Mexico

Sutula, Martha, Thomas S. Bianchi, Brent A. McKee

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ABSTRACT: The annual surface water flux of total reactive (i.e., potentially bioavailable) particulate P from the Mississippi River was estimated by measuring the reactive (including labile, iron, organic, and calcium bound) and nonreactive (detrital) P phases in suspended particulates in the Mississippi River. In addition, the transformation of the major sediment P phases resulting from seasonal channel storage and resuspension was examined. Samples were collected during five cruises over 1 yr at marine and riverine sites. Solid-phase and pore-water nutrients were quantified, and solid-phase P pools were measured using a sequential extraction technique. These results indicate that the Mississippi River exports 134 x 10^6 kg yr^{-1} of total reactive P via surface water. Seasonal hydrological forcing controlled the variability in major P phases found in channel sediments through hydrodynamic sorting. Although the 6-9-month time period during which sediments were stored in the river channel was sufficient to see evidence of early diagenesis in the pore waters, no significant net effect was seen on major P phase distribution. The loss of a significant percentage of labile and iron-bound P appears to be occurring only as these riverine sediments are deposited and reworked on the continental shelf.