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Parameterization of biogeochemical sediment-water fluxes using in-situ measurements and a steady-state diagenetic model

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Sediment biogeochemical processes are important drivers of water column biogeochemistry in coastal areas. For example, sediment oxygen consumption can be an important driver of bottom water oxygen depletion in hypoxic systems, and sediment-water nutrient fluxes support primary productivity in the overlying water column. Yet, biogeochemical sediment-water fluxes are often parameterized crudely and only poorly constrained in coupled physical-biogeochemical models. Here, we present a method for parameterizing biogeochemical sediment-water fluxes realistically and efficiently, using in-situ measurements and a steady state diagenetic model. We apply this method to the Louisiana Shelf where high primary production induced by excess nutrient loads from the Mississippi-Atchafalaya River system promotes the development of hypoxic bottom waters in summer. The implementation of the parameterizations in a coupled circulation-biogeochemical model of the northern Gulf of Mexico results in realistic sediment-water fluxes that enable a sediment-water column feedback at low bottom oxygen concentrations.