Empirical approaches to more accurately predict benthic-pelagic coupling in biogeochemical ocean models

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The recycling and burial of biogenic material in the sea floor plays a key role in the regulation of ocean chemistry. Proper consideration of these processes in ocean biogeochemical models is becoming increasingly recognized as an important step in model validation and prediction. However, the rate of organic matter remineralization in sediments and the benthic flux of redox-sensitive elements are difficult to predict a priori. In this communication, examples of empirical benthic flux models that can be coupled to earth system models to predict sediment-water exchange in the open ocean are presented. Large uncertainties hindering further progress in this field include knowledge of the reactivity of organic carbon reaching the sediment, the importance of episodic variability in bottom water chemistry and particle rain rates (for both the deep-sea and margins) and the role of benthic fauna. How do we meet the challenge?