Remineralization of sedimentary organic carbon in marine systems: from estuaries to the deep sea

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Understanding the preservation of organic carbon (OC) in marine sediments is important for studying the marine carbon cycling and predicting how it responds to climate change. Remineralization process is a key factor controlling the preservation of sedimentary OC (SOC). Here we summarized the distributions of remineralization rates on a global scale in order to better constrain the effects of sedimentary envrionments on the preservation of SOC in marine systems. Globally, the remineralization rates (oxygen consumption rates) decrease from low-latitude to high-latitude and from estuarine to deep-sea regions. High bottom-water temperature (>20ºC) in tropical and subtropical regions can promote remineralization of SOC, whereas low bottom-water temperature (<5ºC) in polar, deep-sea and trench regions result in low remineralization rates. In estuarine regions and their adjacent shelves, anaerobic early diagenetic processes (e.g., sulfate reduction and metal reduction) are mianly responsible for the remineralization of SOC, whereas in deep-sea region oxygen consumption is the main process. In general, large inputs of terrestrial materials, high primary production and frequent physical reworking activities in estuarine regions enhance remineralization of SOC, and further result in intense authigenic minerals precipitation. Particularly, rapid iron redox cycling in estuarine mobile-muds is an impoartant diagenetic pathway for remineralization of SOC due to frequent reworking activities. While in deep-sea regions, relatively stable sedimentary environment and low primary production lead to slow remineralization of SOC and low formation rates of authigenic minerals. In all, the different physical, chemical and biological characteristics in marine environments greatly affect the remineralization of SOC.