Geochemical cycling of U, Re and Mo in coastal sediments

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Uranium (U), rhenium (Re) and molybdenum (Mo) are conservative in oxic seawater but are removed from pore waters to sediments under reducing conditions. We examined the geochemical cycling of U, Re and Mo in coastal sediments, which have shallow oxygen penetration depths, through examination of pore water profiles and benthic fluxes.

U and Re removal from pore waters occurred at approximately the depth of maximum pore water Fe^{2+}, consistent with Zheng et al. (2002) and Crusius et al. (1996). Mo removal from pore waters occurred several centimeters deeper, suggesting that Mo removal required more reducing conditions. Previous literature suggested that authigenic accumulation of Mo is indicative of either anoxic bottom waters (Adelson et al., 2001) or bottom water oxygen concentrations <3 μM (Zheng et al., 2000). However, bottom water oxygen concentrations were ~300 μM, suggesting that this criterion for Mo authigenesis is too limiting. Flux of organic carbon must be considered when determining conditions necessary for authigenic Mo accumulation.

Calculated benthic fluxes from pore water profiles predict large Mn and Fe and occasional U and Mo fluxes to overlying water. However, much smaller Mn and Fe fluxes to overlying waters are measured using benthic chambers. This difference is most likely due to the coarseness of pore water sampling near the sediment-water interface (0.3 cm). Benthic chamber fluxes for U and Mo are consistently into the sediments and show little seasonal variability.

References

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