

Acidification, eutrophication and hypoxia in estuarine and coastal waters

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I will discuss the interactions between acidification, eutrophication and hypoxia in estuarine and coastal waters. I will first summarize various case studies from around the world. Then, based on first principles, I will discuss changes in buffer capacity and acidification in coastal waters as a result of changing atmospheric CO₂, thermodynamics (salinity and temperature), biogeochemical states (levels of eutrophication and hypoxia-anoxia), river and ocean endmember conditions (carbonate vs high organic matter rivers; TA/DIC ratios, etc.) as well as how these factors may interact to increase or decrease acidification in coastal environments. Among case studies, the highly buffered (high TA/DIC content and ratio in both the river and ocean endmembers and high salinity and temperature) and eutrophic-hypoxia Gulf of Mexico and the weakly buffer and highly eutrophic Chesapeake Bay (in particular the interesting acid-base geochemistry at the dynamic oxic-anoxic boundary) will be discussed in details. Finally a new concept of maximum estuarine acidification zone will be discussed.