A global look at contemporary hypoxia in shelf systems

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Hypoxia in acuatic systems has been linked to a decrease in ecosystem diversity, low fishing catches, and an increase in the microphyte population at the expense of higher trophic fauna. Due to these effects, locations exhibiting long-term hypoxia have been termed “Dead Zones”, and presently comprise large areas of the global coast. The global shelf has a large photic zone per areal extent and receives a sizeable input of nutrients from continental erosion, weathering, and other terrestrial processes. These nutrients directly stimulate primary production and the growth of algae, whose decay in the water column consumes oxygen. Anthropogenic activities such as agriculture and urbanization release nutrients into the continental freshwater network and intensify the nutrient export to the oceans. Here, we analyze oxygen and nutrient measurements on a global scale to establish the incidence of hypoxia in various environments. The analysis hints toward marked variations in nutrient ratios and concentrations in different shelf areas yet a strong phosphorus-oxygen correlation throughout the entire Earth. We furthermore explore the relation between antrhopogenic-induced variations in nutrient export to the coast and the temporal changes in nutrient and oxygen concentrations in the shelf since the 1950.