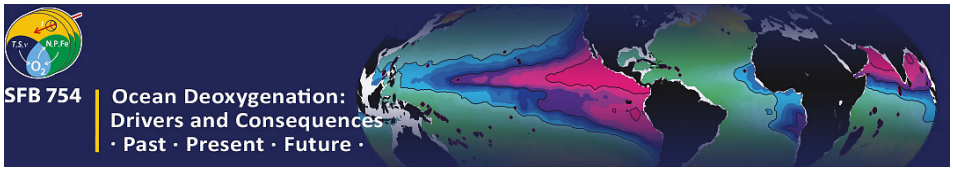

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Assessing the effects of recurring seasonal hypoxia on benthic communities and reconstructing baseline community states on the basis of sediment cores (northern Adriatic Sea)

Tuesday, 4 September 2018 16:30 (15)

Estimating the effects of recurring seasonal hypoxia on the long-term composition, diversity, and functioning of macrobenthic communities on continental shelves is challenging because early 20th century monitoring surveys are rare and the sedimentary sequences in cores are mixed by bioturbation. Here, we evaluate the effects of eutrophication and frequent hypoxic events on macrobenthic communities in the northern Adriatic Sea, where bottom-water dissolved oxygen concentrations were measured since the early 20th century. Previous studies showed that seasonal hypoxia, and occasionally anoxia, leads to mass mortality of macrobenthic fauna in the northern Adriatic Sea and to delayed recoveries occurring for several years. However, long-term consequences of repeated oxygen-depletion events on benthic communities remain unknown.
We account for bioturbation mixing in sediment cores by amino-acid racemization calibrated by radiocarbon dating of the bivalve Corbula gibba at Po Delta and in the Gulf of Trieste. We show that, first, strongly bioturbated sediments typical of natural highstand conditions, deposited in the early 20th century, were replaced by the late 20th century sediments with preserved flood layers and high proportion of total organic carbon (TOC). Second, geochronological dating of bivalve shells shows that the shift from the early to the late 20th century is associated with a decrease in time averaging of death assemblages (from ~25-50 years to ~10-20 years). We suggest that this shift reflects a decline in the depth of the fully-mixed layer from more than 20 cm just to few centimeters. Third, the increase in abundance of the opportunistic bivalve and the strong decline in abundance of hypoxia-sensitive species temporally coincided with the decrease in the depth and frequency of bioturbational mixing, with higher preservation of organic matter, and with higher frequency of seasonal hypoxia in the late 20th century. This depositional and ecosystem regime shift occurred approximately in ~1950 AD. Therefore, the effects of enhanced food supply on the long-term composition of macrobenthic communities were overwhelmed by oxygen depletion even when hypoxic conditions are limited to few weeks per year in the northern Adriatic Sea.

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