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TITLE: Historical trends of hypoxia in Changjiang River estuary: Applications of chemical biomarkers and microfossils

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ABSTRACT:

Over the past two decades China has become the largest global consumer of fertilizers, which has enhanced river nutrient fluxes and caused eutrophication and hypoxia in the Yangtze (Changjiang) large river delta-front estuary (LDE). In this study, we utilized plant pigments, lignin-phenols, stable isotopes (?13C and ?15N) and foraminiferal microfossils in 210Pb dated cores to examine the history of hypoxia in the Changjiang LDE. Two sediment cores were collected onboard R/V Dong Fang Hong 2 using a stainless-steel box-corer; one at a water depth of 24.7 m on Jun. 15, 2006 and the other at 52 m on Nov. 20, 2007, both in the hypoxic region off the Changjiang LDE. There has been a significant increase in the abundance of plant pigments after 1979 that are indicators of enhanced diatom and cyanobacterial abundance, which agrees with post-1980 record of increasing nutrient loads in the Changjiang River. The increased inputs of terrestrially derived materials to the LDE are largely woody plant sources and most likely due to deforestation that began in the early 1950s. However, post-1960 lignin data did not reflect enhanced loading of woody materials despite continued deforestation possibly due to increased trapping from greater dam construction, a reduction of deforestation in the drainage basin since the last 1990s, and soil conservation practices. The lack of linkages between bulk indices (stable isotopes, % OC, molar C/N ratios) and microfossil/chemical biomarkers may reflect relative differences in the amount of carbon tracked by these different proxies. Although NO3? is likely responsible for most of the changes in phytoplankton production (post 1970s), historical changes in N loading from the watershed and hypoxia on the LDE shelf may not be as well linked in East China Sea (ECS) sediments due to possible denitrification/ammonification processes; finally, increases in low-oxygen tolerant foraminiferal microfossils indicate there has been an increase in the number of hypoxic bottom water events on the Changjiang LDE over the past 60 years.

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