



Phytoplankton shifts in response to rapid eutrophication: palaeo-ecological evidence from a polluted coastal embayment in China

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A multi-proxy palaeoecological method has been used to reconstruct a 100-year time series showing coastal eutrophic processes and phytoplankton response. Total organic carbon, total nitrogen, diatom frustules, dinoflagellate cysts, brassicasterol and dinosterol were extracted from chronologic sediment cores in Sishili Bay, a polluted Chinese coastal bay. The variations of these parameters in the cores showed that eutrophic processes occurred during about 1975-1985, which corresponds to increased human activity associated with China's economic development since 1978. During the processes of eutrophication, the biomass of diatoms and dinoflagellates increased and dominant species shifted abruptly. Small heavily silicified diatoms *Cyclotella stylum* and *Paralia sulcata* gradually took the place of the large dominant diatom *Coscinodiscus radiatus*, while dinoflagellates displayed a progressive increase since 1975. Compared with the changes in temperature and rainfall during 1950-2010, increased fertilizer use, marine aquaculture and sewage discharge displayed a better match to the timeline of increased trend in biomass, species shift and nutrient concentration. Altered nutrient supply ratios caused by significant increased nitrogen could play an important role on the shifts in diatom and dinoflagellate assemblages.