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Biogeochemistry of light stable isotopes in sediments of the Pearl River Estuary (China)

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The stable carbon (13C/12C) and nitrogen (15N/14N) isotope signatures of organic carbon and total nitrogen, and the sulphur (34S/32S) isotope signature of reduced inorganic sulphur (TRIS) in sediments from the Pearl River Estuary have been analyzed by combustion stable isotope-ratio-monitoring mass spectrometry (C-irmMS). Besides evaluating the spatial distribution in the Pearl River Estuary as displayed by surface sediments, temporal changes were obtained from the analyses of a dated sediment core down to 55 cm below surface, corresponding to the mid of the 19^{th} century.

Carbon and sulfur isotope signals are depleted in the heavier isotopes compared to surface water inorganic carbon and seawater sulphate, respectively. Nitrogen isotope rtios, on the other hand, display an enrichment of the heavier isotope when compared to atmospheric air. Both, the carbon and nitrogen isotope signals indicate the sources of organic matter (e.g. mixture of different sources), besides possible isotope effects upon early diagenesis. The downcore variations in the sediment core may be caused by changes in the relative proportions of OM sources besides anthropogenic effects due to eutrophication. Whereas C isotopes seem to reflect a binary mixture with marine organic matter as one end-member, the sources, sinks and transformations of nitrogen seem to be more complex. The sulphur isotopic composition of TRIS reflects the dissimilatory activity of bacteria upon diagenetic oxidation of organic matter using dissolved sulphate as electron acceptor. Since the sixties of the 20^{th} century, the activity (rate) of sulphate-reducing bacteria seems to have been increased.