Dynamics of dissolved carbon and nitrogen in intertidal sediment of the Yangtze River estuary

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Due to the rapid turnover of carbon [1] and high rates of nitrogen loss [2], intertidal flats may play an important role in the coastal biogeochemical cycles of organic matter and nutrients. However, few studies address tide-driven dynamics of dissolved carbon and nitrogen in the expansive tidal flats of the Yangtze River estuary, the largest esturary of China. Here we investigated the time-series variations of nutrients and organic matter in pore waters of those intertidal sediments over an exposure-inundation tidal cycle. The variation in pore-water profiles suggests that nitrate, replenished by the tidal current during inundation, was removed rapidly during exposure with an average rate of 457 μmol N m^{-2} h^{-1}. The parallel whole-core incubations under static conditions confirmed the presence of nitrate consumption, with an average rate of 73 μmol N m^{-2} h^{-1} over the 12 h experimental period. Therefore, the intertidal area of the Yangtze River was considered as a sink of nitrate. The pore-water dissolve organic carbon (DOC) concentrations stayed constantly in the range of 366-415 μmol L^{-1} and were ~4 times more concentrated than the adjacent estuarine waters. The intertidal sediments, despite its organic-lean nature (total organic carbon content <0.15%), is likely to act as a DOC source to the estuary via interfacial fluid exchange [3] during flooding. The relatviely constant DOC over the ebb-flood cycle, as in strong contrast to the dynamics of nitrate, implies a metastable state maintained by swift decomposition and remineralization of organic matter. Further work including analysis of other constituents such as dissolved inorganic carbon and dissolved organic nitrogen will be carried out to better understand the coupling between nutrient cycling and organic matter degradation in this dynamic system.

[1] D'Andrea *et al* (2002) *Limnol. Oceanogr.* **47**, 1056-1070 [2] Gao *et al* (2012) *Limnol. Oceanogr.*, **57**, 185-198 [3] Heuttel *et al* (1996) *Limnol. Oceanogr.* **41**, 309-322