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Sedimentary organic carbon oxidation and benthic fluxes of dissolved organic matter and nutrients in the continental shelf sediments of the southern Yellow Sea

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We investigated the total oxygen uptake (TOU), sulfate reduction rate (SRR), and fluxes of benthic dissolved organic matter (DOM) and nutrients at the Yellow Sea cold water mass zone (N3509 and N3507) and the coastal area (N3503) in the southern Yellow Sea. The bottom water temperature and the organic carbon (OC) content of surface sediment measured at N3503 (16.0°C and 0.88%) were the highest, followed by N3509 (10.2°C and 0.82%) and N3507 (8.96°C and 0.22%). The TOU and SRR at N3503 were 24.5 ± 4.99 O_2 mmol m^{-2} d^{-1} and 3.82 mmol S m^{-2} d^{-1}, 3–6 times higher than the values measured at N3509 and N3507 (5.47 ± 0.25 and 4.21 ± 0.35 O_2 mmol m^{-2} d^{-1} and 1.28 and 1.08 mmol S m^{-2} d^{-1}, respectively). The in situ benthic fluxes of dissolved organic carbon (27.3 mmol C m^{-2} d^{-1}) and nutrients (3.17 mmol N m^{-2} d^{-1}, 0.48 mmol P m^{-2} d^{-1}, 3.84 mmol Si m^{-2} d^{-1}) at N3503 were, respectively, 9 and 3–37 times higher than those measured at N3509. The benthic nutrient flux (BNF) at N3503 accounted for 72%–179% of the nutrients required for primary production (PP). By contrast, BNF contributed less than 30% for the N, P, and Si required for PP at N3509. Our results indicated that the elevated temperature and OC contents in the coastal area accelerated the OC oxidation in the sediment, thereby promoting the benthic fluxes of DOM and nutrients.