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Elemental (C/N ratios) and Isotope ($\delta^{13}C_{TOC}$, $\delta^{15}N_{TN}$) Compositions of Surface Sediments from the Barrier Islands in the Nakdong River Estuary, South Korea

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The Nakdong River Estuary (NRE) in South Korea is a typical, artificially-manipulated estuary and blocked by two large dam. The Noksan Dam, built in 1934, blocks the flow of the West Nakdong River, and the NRE Dam was completed between 1983 and 1987 to regulate the flow of the East Nakdong River (called the Eulsuk River locally). For the past half century, several huge industrial complexes have been developed in the reclaimed land near the NRE. In the estuary, the hydraulic circulation has been markedly modified caused by the changes in the river discharge and geomorphic configuration of such as the formation of a series of barrier islands, the two large dams resulting from the artificial control of the natural river flow and upstream intrusion of saltwater by the operation of the two large dams. Consequently, the saltwater wedge that once reached approximately 40 km upstream is now blocked at the dam, considerably reducing the tidal prism. The estuary is typified by barrier-lagoon system with various subenvironments and microtidal with a 1.5 m tidal range.

We investigated the elemental (C/N ratios) and isotopic ($\delta^{13}C_{TOC}$, $\delta^{15}N_{TN}$) compositions of organic matters in various composition in the surface sediments in the NRE. In May 2015, 90 surface sediment samples were collected on and around three islands in the NRE. The mean grain size of the barrier island system in the NRE ranged from 1.1 to 8.9 Φ (average 3.9 Φ) in mean grain size, and they were composed of various sediment types, including muddy Sand (S), sandy Mud (sM), and Mud (M). A useful application of the C/N ratios is as a proxy for assessment of organic matter source change, related to the sediment origins terrestrial or marine. The C/N ratios (average, 5.88) imply that the organic matter in the study area was of marine origins, as indicated by the lower ratios between 4 and 10. The isotope composition of sedimentary organic matter ($\delta^{13}C_{TOC}$, $\delta^{15}N_{TN}$) indicated the deposition of algae-derived organic matter with limited input of terrestrial organic matter. The carbon isotopic values ($\delta^{13}C_{TOC}$) ranged from –28.2 to –16.8 permil VPDB (average, –22.5 permil VPDB), with a nitrogen isotopic values ($\delta^{15}N_{TN}$) in the range of 6.2–12.5 permil AIR (average, 9.4 permil AIR) and C/N ratios in the range of 4.6–7.3 (average, 11.3). These results suggest that the microphytobenthos contribution was greater than the inflow of surrounding land vegetation and had a general marine origin to the north from the barrier islands in the NRE. To the south, the effect was considered mixed. The elemental and isotope compositions of surface sediments in the NRE can contribute to understanding of the biochemical behavior of organic matter around the barrier island system associated with environmental changes caused by coastal construction. Further studies should determine the effects of end-member discrimination on the origins of the organic matter such as advance signature proxy. It is necessary to continue measurements of sediments and water in the brackish water zone around the barrier system from the tidal current vectors at these locations with on-site monitoring results.