Evolution of depositional systems in response to the Holocene sea-level change in Nakdong River Estuarine Delta, Korea

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The Nakdong River Delta, located in the southeastern Korea, preserved thick and wide sediments, which is suitable for the high-resolution evolution of depositional environments in the lower delta plain area. This study traces the Holocene evolution of the Nakdong River Delta using borehole core (ND-3; 46.60 m thick) sediments from the uppermost part of the present-day delta plain. Sedimentary units of the borehole sediments were classified based on grain size compositions, sedimentary structures and geochemical compositions : (A) alluvial zone, (B) estuarine zone, (C) inner shelf, (D) prodelta, (E) delta front, and (F) delta plain. The weathered sediment, paleosol, was observed at 43.16 m below the surface. There is a unconformity (43.10 m) to separate a Pleistocene sediment layer in the lowermost part differentiating from a Holocene sediment layer in the upper part of the core. The inner-shelf sedimentary unit (32.20~23.50 m), in which grain size decreases upward, is overlain by the prodelta unit (23.50~15.10 m) which consists of fine-grained sediments and relatively homogeneous sedimentary facies. The boundary between the delta front unit (15.10~8.00 m) and the delta plain unit (8.00~0.00 m) appears to lie at 8.0 m, and the variation of grain size is different; coarsening-upward in the delta front unit and fining-upward in the delta front unit, respectively. These sediments are characterized by a lot of sand–mud couplets and mica flakes aligned along with cross-stratification, which may be deposited in relatively high-energy environments. Until 13 cal ka BP, the sea-level was 70 m below the present

level and the borehole site might be located onshore. At 10 cal ka BP, the sea-level was located 50 m below the present level and the borehole site might be moved to an estuarine environment. From 8 to 6 cal ka BP, a transgression phase occurred as a result of coastline invasion by the rapid rise of sea-level. Thus, the borehole site was drowned into an inner-shelf environment. After 6 cal ka BP, the sea-level reached the present day, and since then, progradation might begin to form primarily by more sediment input. After this period, progradation phase continues as the sediments have advanced, and the delta grows. In conclusion, as the sea-level rise was being stabilized and the supply of deposits from the land area was increasing, the inner-shelf was filled up and evolved into a progradational delta. The initial prodeltaic environment evolved into delta front and delta plain settings, giving rise to sequential accumulation. Because of little sea-level fluctuation, its deltaic sediments are horizontally distributed.

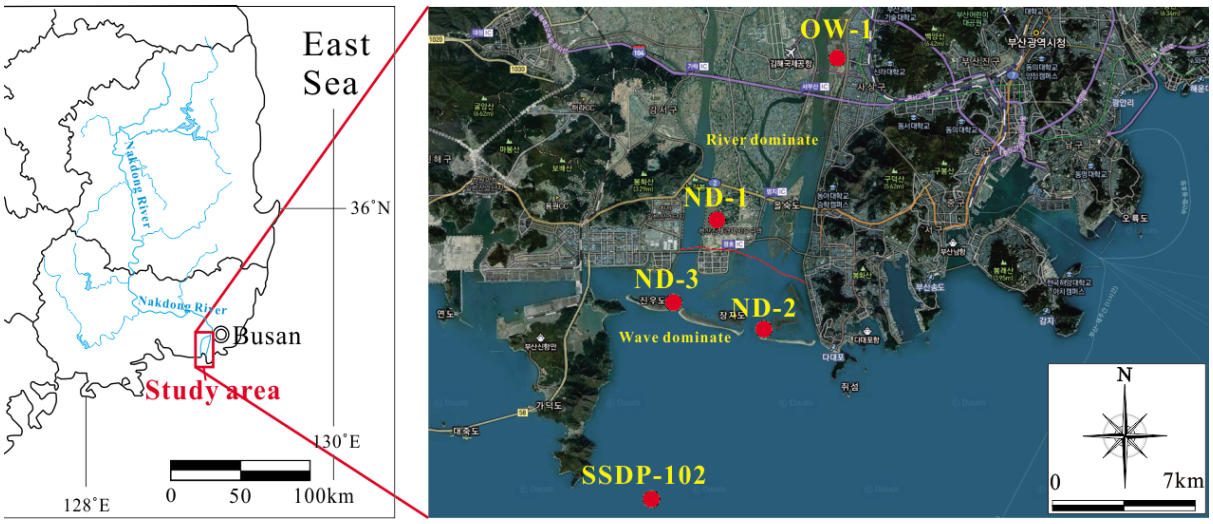

Figure 1. Location map of coring sites in Nakdong River Estuary.

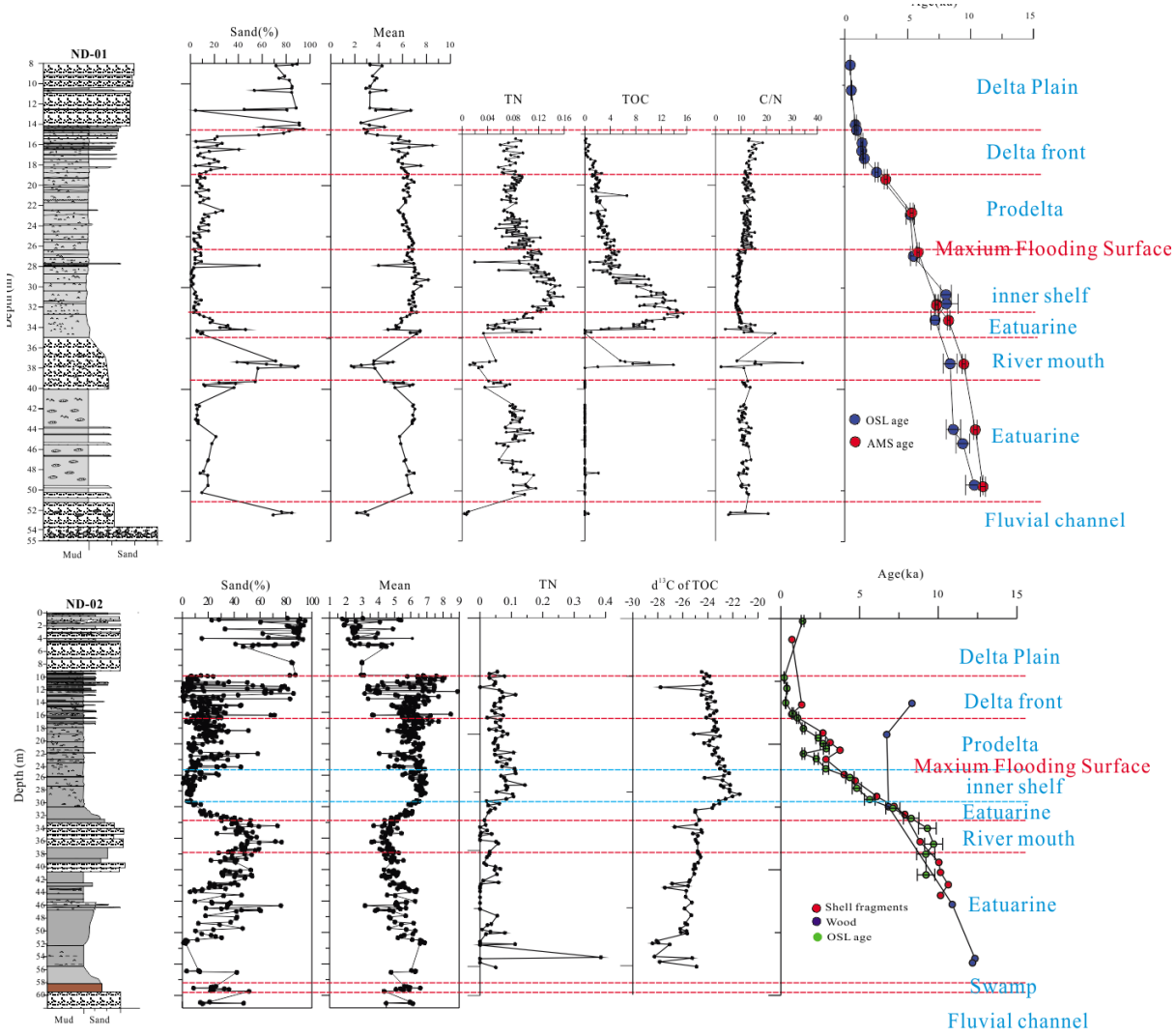

Figure 2. Synthetic correlation among sedimentary columnar section, grain size, organic geochemical composition and AMS, OSL age data of the ND-1, ND-2 core.