



## Late Quaternary transgressive deposits in a low-gradient environmental setting: Korea Strait shelf, SE Korea



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### ABSTRACT

Analysis of high-resolution seismic profiles and sediment data from the Korea Strait shelf reveals that the late Quaternary deposits in this area consist of five sedimentary units deposited during transgression phases of sea-level changes between about 15 and 6 ka BP: ancient beach/shoreface complex (unit P1), estuarine deposits (unit P2), mid-shelf sand sheet (unit M1), sand ridge system (unit M2), and inner-shelf sand sheet (unit M3). They are paralic and marine, separated by a ravinement surface. The lower paralic component below the ravinement surface consists of two sedimentary units (P1 and P2) preserved from shoreface erosion. The top surface of the paralic unit is truncated by a sharp erosional surface. This surface is overlain by three sedimentary units (M1, M2, and M3), which were produced by shoreface erosion that shifted landward during transgression.

The transgressive deposits in this area, considering geometries and distribution patterns, can be divided into three types (I, II, and III). Type I overlying the lowstand systems tract is confined to the shelf margin, and consists of a thick paralic unit P1 and a relatively thin marine unit M1. Type II on the mid shelf has no paralic component and the marine units M1 or M2 directly overlie the sequence boundary. Type III, found in the inner shelf, includes a thick paralic (unit P2) and a thin marine (unit M3) component. It is completely covered by the highstand systems tract.

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### 1. Introduction

The sea-level rise that occurred after the Last Glacial Maximum (LGM) was one of the most important geological events to impact continental shelves (Demarest and Kraft, 1987; Nummedal and Swift, 1987). As the shelf was flooded, coastal environments progressively migrated landward, with accompanying erosional and depositional processes (Trincardi et al., 1994; Cattaneo and Steel, 2003). Various sedimentary units were deposited over a wide area of the shelf showing different seismic facies and lithologic associations. To reconstruct the depositional history of these sedimentary units in terms of sea-level changes, sequence-stratigraphic concepts (e.g., Posamentier et al., 1988) have been applied to modern continental shelves, using high-resolution seismic profiles and sediment data (Saito, 1994; Trincardi et al., 1994; Yoo and Park, 2000; Cattaneo and Steel, 2003; Lobo et al., 2004; Labaune et al., 2005; Rabineau et al., 2005; Zecchin et al., 2008).

The study area located between the Korean Peninsula and Tsushima Island is a seaway connecting the East Sea in the northeast and the East China Sea in the southwest (Fig. 1). Previous works have used high-resolution seismic profiles and sediment analyses in this area to reveal that relative sea-level changes, coupled with sediment input from the Nakdong and Seomjin rivers, played a major role in the development of the late Quaternary sequence on the shelf (Suk, 1989; Min, 1994; Yoo et al., 1996; Lee and Chung, 2000; Yoo and Park, 2000; Yoo et al., 2004). During the Last Glacial Maximum (LGM), the study area completely was exposed, resulting in the subaerial erosion associated with paleo-channel incision of Nakdong and Seomjin rivers (Min, 1994; Yoo and Park, 2000). The postglacial transgression in the area began about 15–16 ka BP (Park et al., 2000). Since that time, various sedimentary units formed on the shelf of the study area (Suk, 1989; Min, 1994). Such deposits are well recorded on the seafloor and bear witness to the complex interplay between depositional and erosional processes, which are closely related to sea-level changes. Because of these features, the study area is a good site for gaining a better understanding of the depositional and erosional processes associated with a low-gradient shelf environment that occurred during the Holocene sea-level rise. In

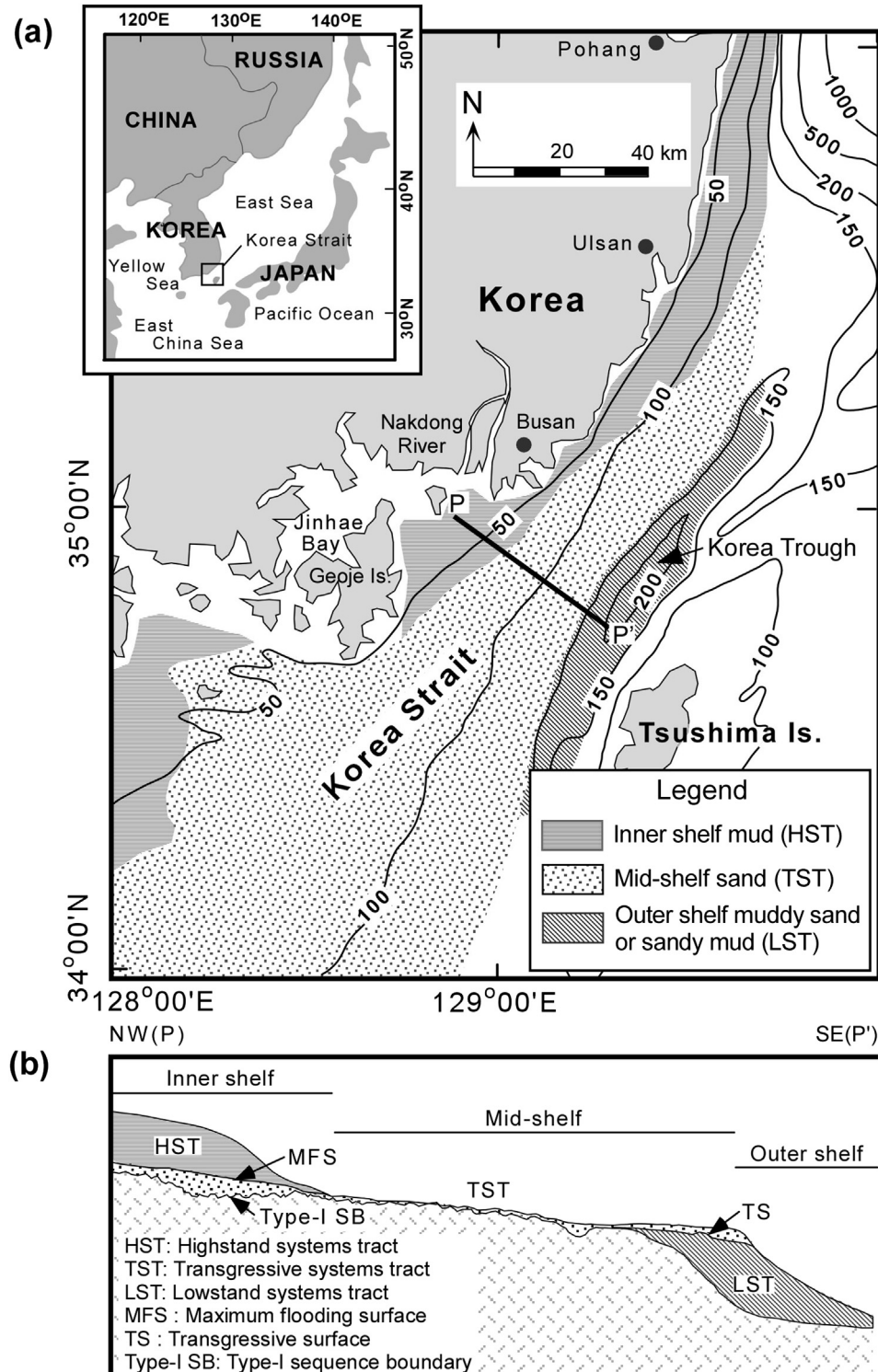
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this paper, we attempt to use high-resolution seismic data to describe the acoustic characteristics and geometries of transgressive units, to discuss the depositional and erosional processes of the postglacial transgression and finally to reconstruct the transgressive stratigraphic architecture related to the sea-level rise.

## 2. Study area

The Korea Strait shelf can be divided into three regions: inner, mid- and outer shelves based on morphology and surface sediment distribution (Fig. 1a). The inner shelf (<80 m deep), which consists of a highstand systems tract, occupies a near-coastal area that



**Fig. 1.** (a) Map showing the bathymetry and the surface sediment (contour in m). Mud is confined to the inner shelf along the coast, whereas sand is widely distributed on a wide area of the mid-shelf. Muddy sand and sandy mud occur only in the Korea Trough. (b) Sequence stratigraphic architecture in the Korea Strait (Yoo and Park, 2000). Note that the late Quaternary sequence above the sequence boundary consists of a set of lowstand (LST), transgressive (TST), and highstand (HST) systems tracts separated by transgressive surface (TS) and maximum flooding surface (MFS). The LST and HST are confined to the outer and the inner shelf, whereas the TST is widely distributed on the mid-shelf. Although TST is distributed on a wide area of the shelf, it is much thinner than LST and HST.

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