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Seasonal morphodynamics of multi-bar on macrotidal beach, west coast of Korea

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Many of macrotidal beaches contain a series of shore-parallel sandbars, developed under relatively low-energy conditions. The morphology of the multiple intertidal bars is highly dynamic, in response to wave climates. Four lines of sandbars on ca. 500 m stretches of intertidal zone, Shinduri, west coast of Korea, are found in a semi-closed embayed beach with a tidal range of over 6 m. The seasonal dynamics are, however, poorly documented. In order to understand the seasonal morphological changes and their hydrodynamic forcing, three-years of topographic survey using a VRS-GPS system and drone photogrammetry have been conducted on six monitoring transects. An ADV and ADCP was additionally deployed to collect wave data on a bar crest. Mean grain sizes show generally shoreward coarsening trend, ranging from 2.0 to 2.75 phi. Sediments became coarser in summer, but finer in winter, which are contrasting to other beaches in the west coast of Korea. Wave data show strong seasonality, high waves in winter and much gentler waves in summer, suggesting the study area experienced by monsoon climate. Topographic surveys show that four ridge and runnel systems are prominent during summer, whereas, in winter, they are insignificant. From the spring to summer season multi-bar starts to form under low-energy waves, leading to bar crest accretion in all profiles measured. Conversely, during the fall to winter seasons, significant of cross-shore bar migrations and hence flattening of crests of sandbars have been observed due to dramatic increase in wave energy. This signifies that local wave condition is more important for maintaining patterns of multiple bars even in macrotidal setting.