

Sediment dynamics and morphological change on the upper beach of a multi-barred macrotidal foreshore, and implications for mesoscale shoreline retreat: Wissant Bay, northern France

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Summary. Wissant Bay, on the Dover Strait coast of northern France, evinces one of the highest shoreline erosion rates in France. In order to investigate the mechanisms of this severe erosion, a beach transect was surveyed once a month from January 2004 to January 2005. This monthly survey was accompanied by a two-week experiment in January 2005 aimed at directly relating hydrodynamic conditions with changes in the morphology of the upper beach up to the dune face. The experiment recorded variable wave conditions and included the most severe storm (in January 2005, with wind speeds up to 19 m s^{-1}) between 2003 and 2006. The experimental results highlight the preponderant role of longshore currents and the alongshore migration of bedforms throughout the beach profile. Bedforms on the upper beach consist of large sand waves. Cross-shore currents and cross-shore sediment transport are much weaker. A global analysis of the 1-year topographic survey showed that the upper beach was characterised by a highly fluctuating sediment budget and even registered a net gain following a severe storm in January 2005. This fluctuating budget is explained by the actively migrating bedforms. Sand released from chronic shoreline retreat is, over the long run, evacuated by the strong longshore currents towards the northeastern sector of the bay, which is presently undergoing accretion, thus, highlighting a pattern of progressive beach rotation that may be embedded in larger-scale changes associated with the tidal sand ridges and banks that characterise the adjacent storm- and tide-dominated shoreface.