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Multiple intertidal bars: Three years of cross-shore and longshore dynamics

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Multiple Intertidal bars (MITB) are complex features described as a succession of sandbars located within the intertidal area of meso- to macrotidal beaches. Despite being found in many locations where conditions allow, the dynamics of these coastal bedforms remain unclear. They appear to be long-term features, relatively stable in form, but at the same time their movements can be prone to strong, short-term dynamics. MITB can play a significant role in wave energy dissipation as well as helping protect the beach/dune system to energetic events. In the context of sea level rise, our understanding of their behaviour over short to longer timescales, is important for coastal management and adaptation planning.

Three years of monthly DGPS surveys, conducted in Dundrum Bay (Northern Ireland) from May 2019 to April 2022, along with analysis of offshore wave forcing, were investigated to characterise both cross-shore and longshore dynamics. Additional cross-shore profiles were recorded every 10m to gather more detailed topographical understanding of changes in the intertidal. From interpolated topographic surveys, we identify complex sediment exchanges between the dune, the upper and intertidal beach areas. In addition, survey-to-survey difference maps as well as cross-shore profiles, were used to track cross-shore migrations of sandbars across the intertidal areas.

Preliminary results suggest that both incident wave energy and its direction are key hydrodynamic forcing variables that drive cross-shore migrations. Understanding sediment exchange between the different cross-shore sections of the beach is however, more complex and still under investigation.

Cross-shore drainage channels, essential in evacuating water-excess during tidal ebb, were observed intersecting bars at several locations. The evolution of these channels was closely associated with the alongshore migrations of bars. Cross-shore channels show a migration towards the inlet, that separates two main sections of the site, suggesting a migration of MITB bars towards the inlet. Consequently, a longshore sediment transport takes place from each sides of the bay toward the inlet, highlighting the significant role the inlet has in sediment circulation cells within Dundrum Bay.