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TIDAL ASYMMETRIES IN HYDRODYNAMICS DO NOT NECESSARILY CONTROL SEDIMENT TRANSPORT IN HYPER-TIDAL SAND FLATS.

C. A. Unsworth[1,2], I. D. Lichtman[1], M. E. Williams[1,3], P. D. Thorne[1], J. Brown[1], X. Wei[1] & L. O. Amoudry[1]
1 National Oceanography Centre, Liverpool, L3 5DA, UK.
2 Now at School of Ocean Sciences, Bangor University, Menai Bridge, Isle of Anglesey LL59 5AB, United Kingdom.
3 Pontificia Universidad Católica de Chile.

The transport of sediment on intertidal sand flats is often defined from the perspective of tidal asymmetries. For intertidal flats with micro to mesotidal ranges, sediment transport is often directed offshore due to processes which promote ebb dominance. Hyper-tidal sand flats (tidal range > 6 m) present a system where flood dominance is such an overriding control on tidal asymmetries that processes which are usually considered to produce ebb dominance via the alteration of tidal asymmetries (e.g. waves and fluvial discharge) may not have the same effects on net tidal sediment transport as usually assumed. We present observations of hydrodynamics coupled with 3D measurements of bedforms and multifrequency acoustic backscatter systems from a hyper-tidal sand flat in both summer and winter conditions. Our results demonstrate that even during seasonally typical wave events and river discharges, flood dominance on both bedload and suspended load is maintained. We found that the peak flow depth and peak current speed were good predictors of net sediment transport on the hyper-tidal flat, whilst the presence of waves modified this relationship. Waves at neaps increased net sediment transport (shoreward) per tide, compared to non-wavy neaps. High-water resuspension and ebb transport during springs was not enough to reverse the flood dominant tidal asymmetry. Our findings are notable as simultaneous field measurements of hydrodynamics, suspended sediments and bedforms sand flats are rare. Our results suggest that hyper-tidal sand flats are likely to respond to storms and climate changes differently to micro-meso tidal sand flats.