

Bedform morphology across the fluvio-tidal transition, Columbia River, USA

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Bedload transport within the fluvio-tidal zone is governed by the interaction between unidirectional currents with tidal flows of varying magnitude, which show appreciable spatio-temporal variation across a range of scales, with the additional superimposition of waves. These changes in the controlling hydraulics should be reflected in the differing characteristics of bedforms within this region, ultimately governing the preserved sedimentary facies. We have examined the morphology of bedforms in the fluvio-tidal transition in the Columbia River (USA), through analysis of high-resolution multibeam echo sounder data collected in 2009 by NOAA (National Oceanic and Atmospheric Administration) and extending from near the mouth of the river to c. 82 km upstream. These data have been used to characterize the differing types of bedforms in the main channels of the Columbia River and their geometric characteristics, including planform geometry, dune orientation, bedform asymmetry index and leeside angle. The data show a marked increase in the planform two-dimensionality of bedforms near the river mouth, where the dunes are also both more symmetric and smaller in amplitude than those further upstream. The data also shows dune orientation to depend on distance from the river mouth and lateral position in the channel and sand bars. Additionally, there are regions of channel bed where the mobile sand appears to be moving over a more resistant substrate that influences the geometry of the bedforms. This paper will illustrate the nature of bedforms across this transition and discuss the implications of these results for sedimentary facies in the tidally-influenced fluvial zone.