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Bar morphodynamics in the tidally-influenced fluvial zone

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The hydrodynamics and deposits of the Tidally-Influenced Fluvial Zone (TIFZ) are complex because it experiences competing fluvial and tidal flows and spatially and temporally variable rates of sediment transport and deposition. This paper presents a new integrated field dataset from the Columbia River Estuary, USA, that quantifies the morphodynamic response the bed morphology and bar stratigraphy to fluvial-tidal flows.

A 3-year, field and modelling program that started in 2011, has been monitoring the dynamics and deposits of a 40 km-reach of the Columbia River Estuary. Data obtained so far throughout the TIFZ include: bathymetry using MBES, flow using ADCP, subsurface sedimentology using GPR and shallow coring to 5 m.

Initial results from the programme suggest there is a complex spatial and temporal lag in the response of the bed morphology and deposits to the fluvial-tidal flows. Zones of strong ebb and flood flow do not necessarily produce channel beds dominated by bi-directional bedforms. Many mid-channel bars are stable over decadal time periods. This paper will illustrate the variety in bar morphologies and channel change throughout the fluvial-tidal zone and contrast these bar dynamics with examples from purely fluvial environments.