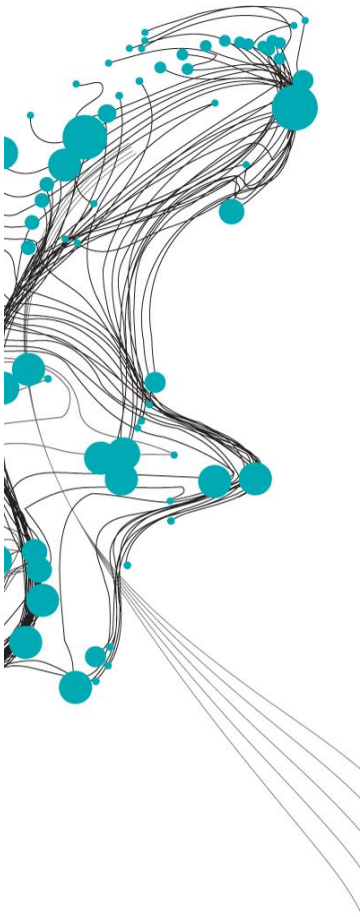
MANGROVE DYNAMICS IN THE RICHMOND RIVER'S ESTUARY



Mangrove forest width is thought to be an important factor for the adaptation capacity of mangroves. Therefore, the aim of this research is to gain insight in the morphodynamic response of two transects of different mangrove forest widths (150 m and 250 m), when variations in river discharge and fluvial sediment concentrations are considered. A field campaign in the South Ballina mangrove forest (New South Wales, Australia) has been executed. Field observations showed that the effect of mangrove width on the biophysical properties and interactions is limited. This study concludes that the estuarine location (with respect to the river mouth), bio-geophysical settings (in relation to river bends and trainer walls) and other transect properties related to the surface elevation are the major causes for the observed differences within the mangrove forest, and not the mangrove forest width.

In addition to the field campaign, two depth-averaged process-based numerical models were developed in Delft-3D Flexible Mesh (DFM). The models of the two field transects allowed for comparison of the impact of mangrove width on the morphodynamic response to variable river discharges and fluvial sediment concentrations, by means of model simulations. The results from the model study regarding the effect of the mangrove forest width on the biophysical dynamics and interactions remains inconclusive, since no direct comparison could be made regarding variations in mangrove width only. During low discharge conditions, both models showed a turnaround from ebb-dominant towards flood-dominant flow conditions in the mangroves throughout the spring-neap cycle. This could lead to an accumulation of water in the estuary, resulting in net accumulation of sediments in the river stream and on the foreshore. River flood conditions were found to lead to larger velocities within the forest at the 'long' transect compared to the 'short' transect, which is attributed to the width of the flow domain of the model. Furthermore, this study concludes that the Richmond River has a limited capacity for river flood discharge. When this capacity is exceeded, flooding of the adjoining mangroves as a traditional floodplain occurs. The mangroves then provide for floodwater storage and discharge, facilitating enhanced sediment deposition.

The findings in this study strongly indicate the need for a-periodic flood events to occur, in order for higher elevated parts of the mangrove forest to inundate and accrete. It is recommended to develop two identical models only differing in mangrove width, enabling a comparison of the contribution of mangrove forest width to accretion rates in mangroves.

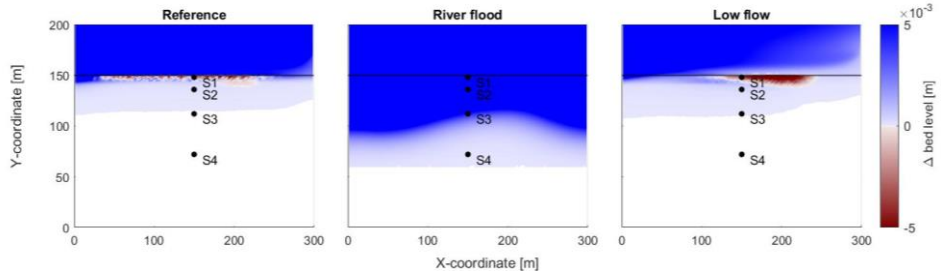


Figure 1: Morphodynamic results for the three scenarios of the 'shorter' transect

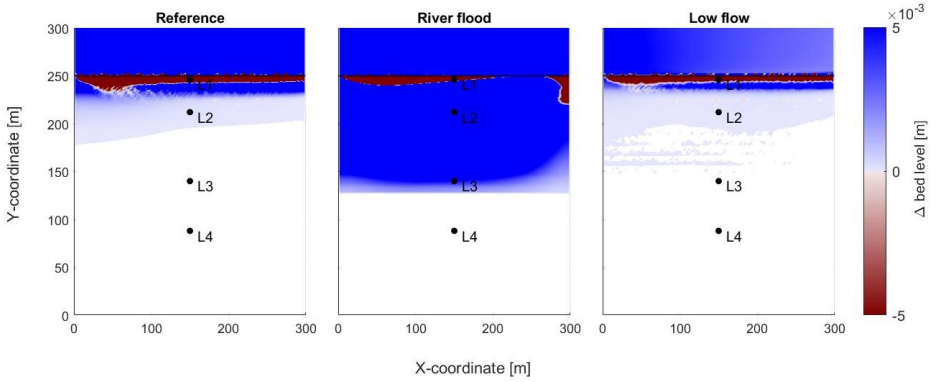


Figure 2: Morphodynamic results for the three scenarios of the 'longer' transect.

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