Seasonality in morphological behaviour at the interface of salt marshes and tidal flats using high temporal resolution field data

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Sediment dynamics at tidal flats is a key parameter for driving ecosystem dynamics, connecting the long-term cyclic behaviour of the marsh to (changing) large-scale physical forcing (Bouma et al., 2016). Sediment dynamics plays an important role in seedling establishment in marshes (Silinski et al., 2016). However, we still need to quantify sediment dynamics to predict key ecological processes of seedling establishment and the initiation of cliff erosion (Bouma et al., 2016). This study shows long-term high temporal resolution time series of sediment dynamics and explains the dynamics using physical parameters.

Bed level changes were assessed using SED (Surface Elevation Dynamics) -sensors (Hu et al., 2015), located at the interface of the tidal flat and marsh. Transects with 4 to 7 SED-sensors were measured at 4 locations in the Westerschelde: Zuidgors and Zimmermanpolder (North coast) and Paulinapolder and Hellegatpolder (South coast). The time series, containing raw data at least every 30 minutes, were analysed using a recently developed autonomous script. This resulted in more than a year of bed level data for all locations (except for the Paulinapolder; 10 months). The results show a clear temporal (seasonal) and spatial pattern of bed level changes (Fig. 1). The variability decreases from the sea to the vegetation edge and increases a little going into the vegetation at all sites. The Northern sites show a more positive variability in Spring and Summer and more negative variability in Fall and Winter, while the southern sites show a more equally distributed variability. In general the most variability is shown in the Spring.

The (pre)dominant wind direction in the Westerschelde is approximately perpendicular to the vegetation edge of the Northern sites. This can be the driver of the high range of variability at those sites. The high variability in the Spring can be driven by the appearance of diatoms during this season (Le Hir et al., 2007). Quantifying the extent to which sediment dynamics occur, contributes to the understanding of thresholds of seedling establishment in space and time.

Bouma et al., (2016). Short-term mudflat dynamics drive long-term cyclic salt marsh dynamics. *Limnology and Oceanography*.

Hu et al., (2015). Continuous monitoring bed-level dynamics on an intertidal flat: Introducing novel, stand-alone high-resolution SED-sensors. *Geomorphology*.

Le Hir et al., (2007). Sediment erodability in sediment transport modelling: Can we account for biota effects? *Continental Shelf Research*.

Silinski et al., (2016). Quantifying critical conditions for seaward expansion of tidal marshes: A transplantation experiment. *Estuarine, Coastal and Shelf Science*.

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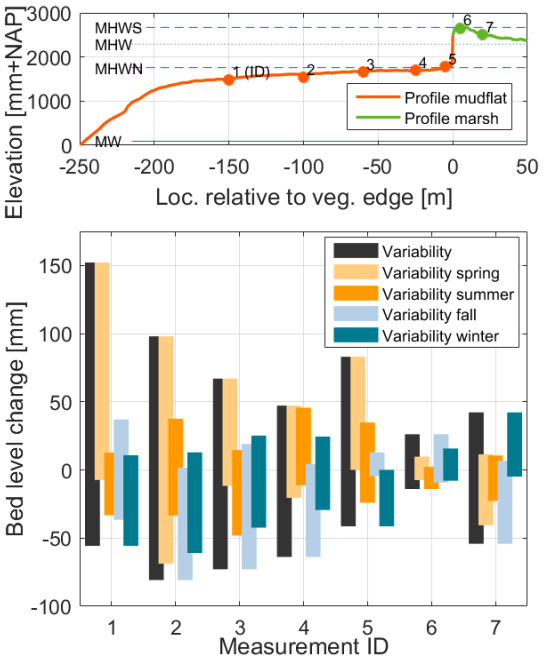

Figure 1. Seasonal sediment dynamics at the Zuidgors (Westerschelde, NL). A profile perpendicular to the coast with 7 measurement points including the mean water (MW), mean high water spring (MHWS), mean high water (MHW) and mean high water neap (MHWN) are showed (top panel). The total range of variability (max. and min.) and the seasonal range of variability relative to the first measurement of the period (total of season) are showed (bottom panel).