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USING SHALLOW NEARSHORE BERM NOURISHMENTS TO ENHANCE BEACH WIDTH

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INTRODUCTION

Nearshore berms or shoreface nourishments are sandy coastal interventions in which sediment is placed seaward of the land-water interface. These projects rely on natural forces to redistribute sediment in the nearshore zone and mitigate erosion, increase beach width or both. However, there is still limited knowledge on the connection between the morphodynamic development of the nourishment body and the changes to the beach landward to it.

Several aspects make it difficult to connect the changes in the sub-aqueous and sub-aerial zones of the cross-shore profile, amongst others the lack of data and the small signal in beach changes with respect to the natural variability. We hypothesize that this obscurity also originates from the deep placement of most nearshore berms, making them mobilized very infrequently.

METHOD

This study examines observations of a unique shallow nearshore berm at New Smyrna (FL) where about 350,000 m3 of sediment dredged from a nearby inlet was deposited in the nearshore zone by moving the end of an outflow pipe along a 400-m section of coast (Fig 1 top). The concentrated nature of the sediment deposition resulted in a nourishment crest that was occasionally near the low tide water level during construction.

This site was monitored with a mini Argus-system, providing hourly imagery data of the nearshore zone. The nourishment deposition locations, nearshore bar, and shoreline positions were extracted from these Argus images.

The observations are combined with numerical modelling, examining how different nourishment elevations related to different regimes: with active wave breaking, non-breaking (onshore transport generating) waves and conditions with negligible wave action near the crest of the nourishments.

RESULTS & CONCLUSIONS

Imagery data taken during and after implementation of this nourishment show a rapid increase in beach width landward of this nourishment. This increase in beach width extents over a larger alongshore distance (~1200m) than the original nourishment (Fig 1 bottom) and a clear impact of the change in nourishment body and the beach response is observed.

The conceptual modelling reveals the impact of the water depth on the nourishment crest on the cross shore transports and the alongshore wave driven sediment transport in the lee of the nourishment.

Imagery data and modelling results are combined to discuss wave breaking regimes and to reflect on the working mechanisms of nearshore berm nourishments. These regimes can assist in decisions on nourishment design and in particular how elevation of the nourishment can be used to steer nourishment performance on the landward beach.

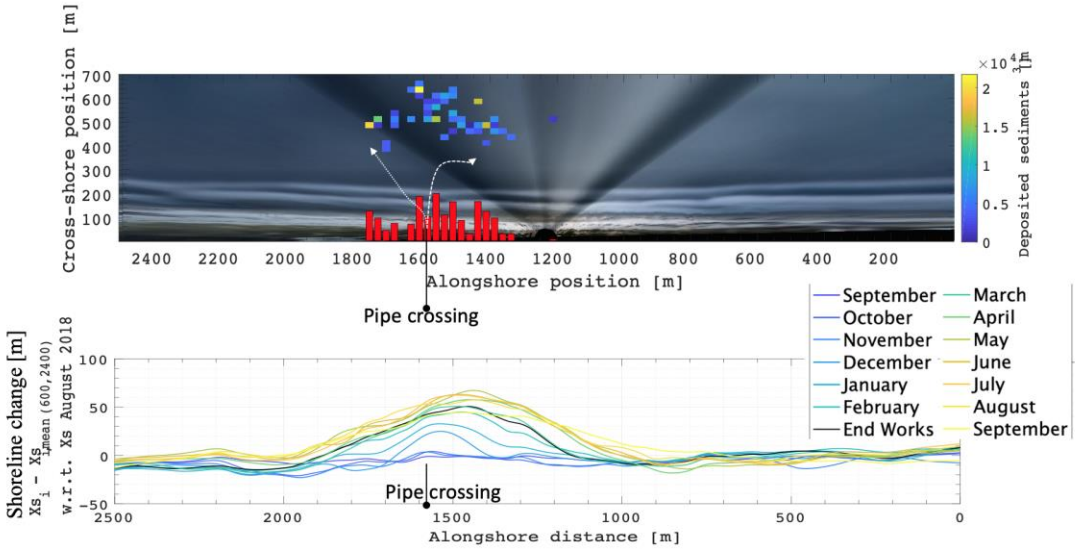

Figure 1 - Top) Rectified Argus image of New Smyrna Beach. Nourishment disposal locations are shown by the blue to yellow cells. These colors indicate total dumped sediment. The red bars show the cross-shore integrated volumes.
Bottom) Extracted shorelines in the period of sediment disposal (Sept-Feb) and afterwards (March-Sept). Shoreline positions are relative to the shorelines at adjacent beach sections (at alongshore distances 600 and 2400 m) and with respect to August 2018 (before the works).