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Building and destroying beach berms and dunes – the role of longshore gradients, storm waves, wind and vegetation.

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Dunes play an important role in the safety of low-lying barrier coasts and represent important ecosystem values. The effects of storms on dune erosion is well documented through lab and field data and a number of adequate models are available to assess this. What these models are less good at is restoring the (often quite steep) beach berm and upper shoreface; the aeolian processes and the vegetation growth affecting them are rarely modelled explicitly, or lack a subaqueous component, e.g. Duran and Moore, ref. Recently, some approaches have been developed or are under development, e.g. in the WINDSURF consortium (e.g. Moore et al., 2016) that combine models for subaqueous and subaerial transport and morphology change, including vegetation growth and its effect on transport. In Roelvink and Costas (2015) a coupled 1D system was presented that allows different models to act on the same profile.

In the presentation we will present progress in this modelling, on a number of fronts:

• The representation of the relatively steep slopes of the upper shoreface at ocean beaches such as at Praia de Faro, Portugal; maintaining realistic profile shape in the intertidal area and swash zone is essential in linking subaqueous and subaerial processes

• Refinement of the representation of slope processes, vegetation growth, effects of vegetation on critical velocities and on the shear velocity.

• Incorporation of longshore transport gradient effects, enhancing or reducing the effects of storms on dune erosion.

We will discuss simulations over periods of several years applying realistic time series of wave and wind conditions that show promising agreement with observed foredune development, for realistic vegetation patterns and growth scenarios. Finally we will investigate through sensitivity runs how the dune growth is affected by the accommodation space on the upper beach and the frequency of extreme wave and wind events.

References

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