Wave dissipation over vegetation

M.Sc. Graduation project

Outline:

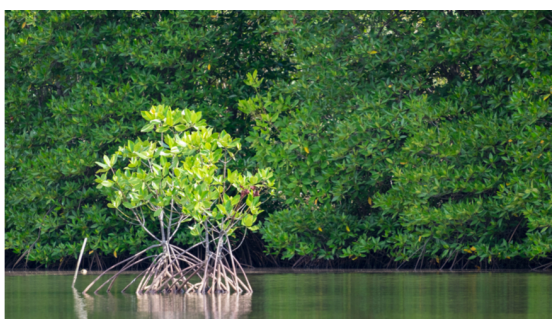
Large-scale modelling of waves with spectral wave models such as SWAN is indispensable for design of coastal structures and the assessment of flood risk. Wave dissipation due to bottom friction is often modelled by a relatively simple and accepted formulation including a calibration parameter. The approach works out for average bathymetries with e.g. sandy material. One of the exceptions is the modelling of wave dissipation due to submerged or emerging aquatic vegetation. Wave dissipation over canopies with any kind of species has been measured at numerous locations all over the world, providing insight in the physical process and validation material for the various models that have been developed so far.

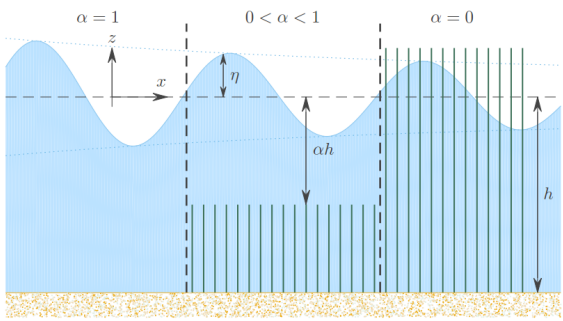
Within the BE-SAFE project wave measurements over a canopy in the Dutch Wadden Sea were carried out during several storms. Locally generated waves were strongly dissipated, while the low-frequency waves hardly lost any energy through the vegetation field. The wave model SWAN strongly overpredicted the wave energy close to the dike. Increasing the bottom friction or applying the available vegetation module in SWAN brought the modelled wave energy closer to the measurements, but the modelled and measured spectral energy distribution still showed significant and not yet understood differences.

Recently Jacobsen et al. (2019) published a new, frequency-dependent dissipation model for waves propagating over a canopy. This is considered as a promising development. The goal of the graduation project is to improve the presently available vegetation module in SWAN, e.g. by implementing the formulation of Jacobsen et al. (2019). This might include a further refinement of the formulation or reanalysis of the measured data. The model by Jacobsen et al. (2019) is formally limited to rigid vegetation, so the effect of flexibility of the stems on wave dissipation under varying wave climates will also be considered.

Reference

Jacobsen, McFall, Van der A (2019). A frequency distributed dissipation model for canopies. Coastal Engineering, 150, 135-146





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Qualifications:

- You are a pro-active student with excellent grades.
- You have a good theoretical knowledge about potential wave theory and preferably some experience with SWAN.
- You have experience with coding.
- You are curious, self-motivated and know when to ask for help.

You will be stationed at Deltares for the duration of your research project. More information on Deltares: www.deltares.nl.

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