Utrecht University

SEAWAD

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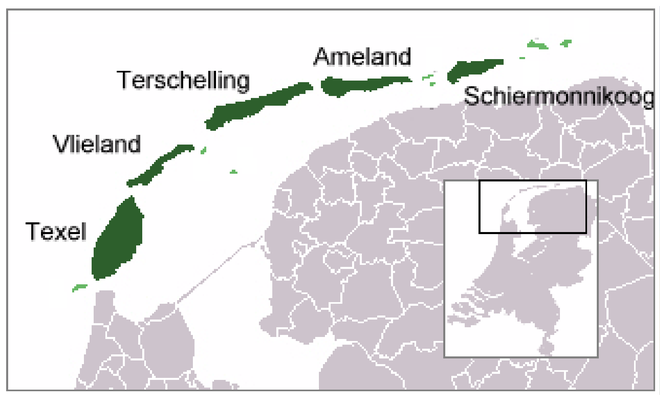
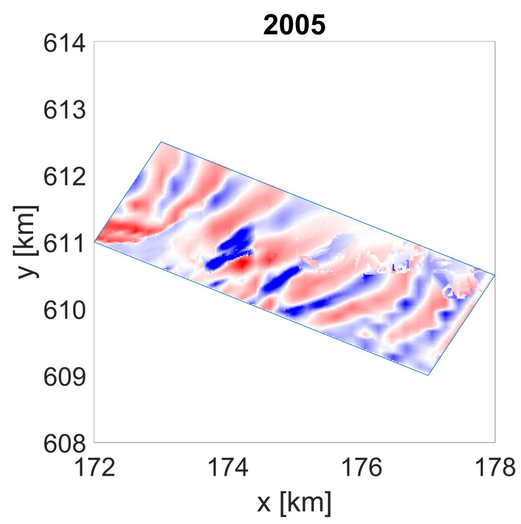
Bedform dynamics on ebb-tidal deltas

Project goal:
Quantify the sediment fluxes on the ebb-tidal delta of Ameland.

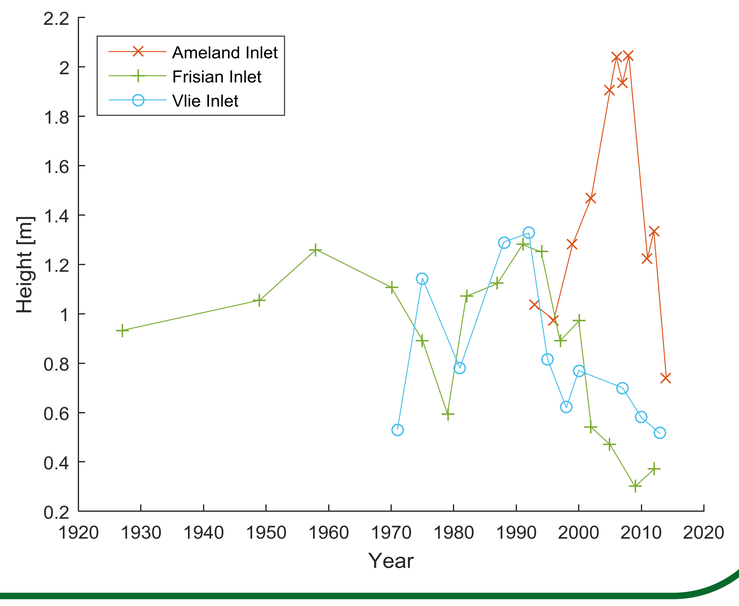
Thesis topic:
The influence of bedforms on sediment transport.

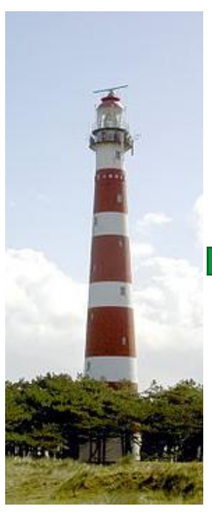




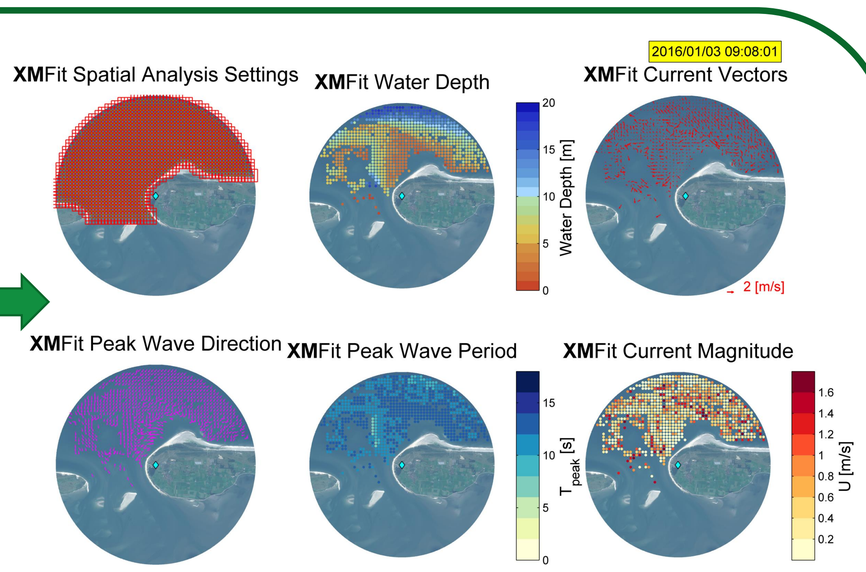
Left: the saw-tooth bar field north of Ameland in 2005. Saw-tooth bars are approximately 2m high and have a wavelength of 500-1000m. They are always found on the downstream part of the ebb-tidal delta lobe, in water depths of 5-10m.

Right: Saw-tooth bar heights for 3 inlets through time. Bathymetries from **singlebeam measurements** give an impression of bedform dynamics, but frequency is max 1/year → **coupling to hydrodynamics not possible**





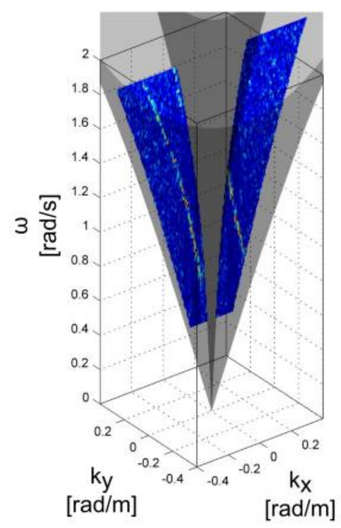
XMFit



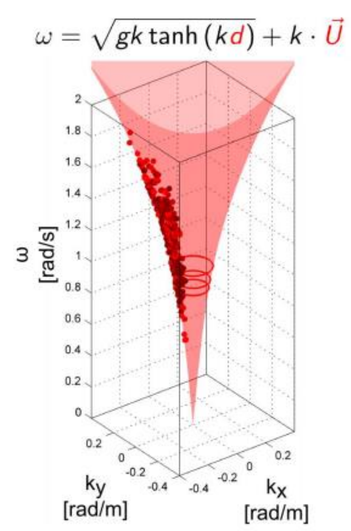
The X-band radar system on the lighthouse of Ameland gives an image of sea clutter every 3 seconds. The XMFit model processes this and returns water depth (bathymetry), current direction and magnitude and peak wave direction and period. Thus, the **relation between hydrodynamics and morphodynamics can be studied**.

XMFit uses a 3D Fast Fourier Transform (FFT) of the original images. The resulting wave components (kx, ky, ω) from the image spectra are used as input for the Doppler-shifted linear dispersion relation. XMFit includes this algorithm, which is able to simultaneously extract depth, surface currents and wave parameters. This is an improvement to routines like Cbathy, who ignore the presence of currents.

If you improve current predictions, bathymetry predictions will automatically improve as well!



Filtered Image Spectra



Depth Inversion Fitting