Mussel bed shape relates to wave forcing

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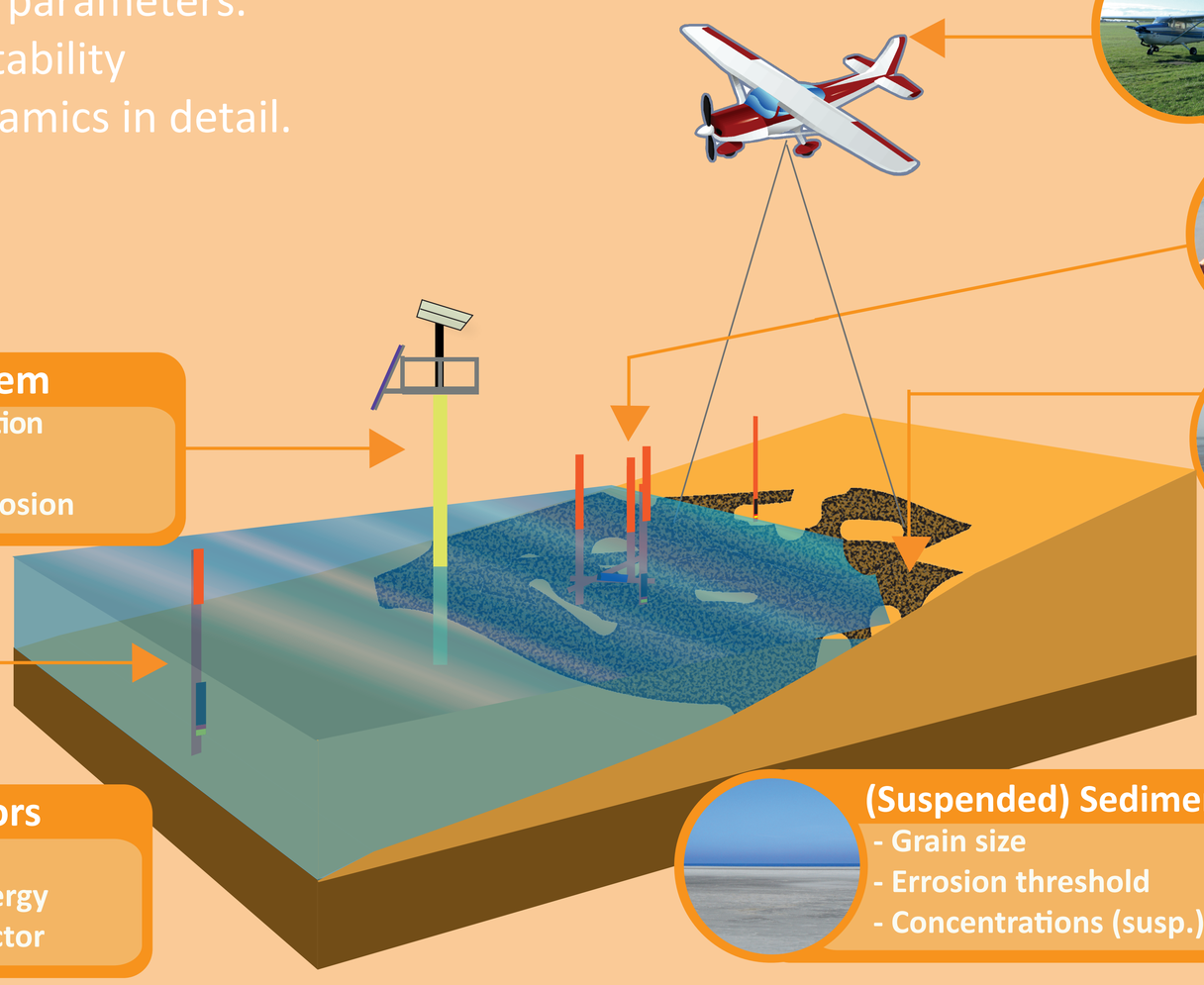
Introduction

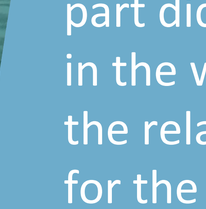
In the year 1990 nearly all mussel beds in the Wadden Sea had disappeared. While in the eastern part of the Dutch Wadden Sea the beds have restored, restoration in the western part did not occur. In order to investigate mussel bed stability and chances for restoration in the western part of the Wadden Sea project Mosselwad was started. At UU we research the relation between hydrodynamical forcing and mussel bed stability. Here we show that for the mussel bed at **De Cocksdorp, Texel** there is a clear relation between wave forcing and the spatial distribution of mussel cover.

Field Measurements

Focussing on:
- Establishing model parameters.
- Determining bed stability
- Studying hydrodynamics in detail.

Each year during fall
1.5 month





Camera system
- Wave propagation
- Currents
- Mussel bed erosion

Aerial observations
- Locate mussel beds
- Create panorama (UAV)
- Create friction grid

Velocimeters
- Wave & Current direction
- Turbulence intensity
- Current friction factor

DGPS mapping
- Height map
- Model input grid

Pressure sensors
- Wave forcing
- Loss of wave energy
- Wave friction factor

(Suspended) Sediment
- Grain size
- Errosion threshold
- Concentrations (susp.)

Results

- *Wave friction factor 10x larger over mussel bed than tidal flat*
- *Waves are locally generated*
- *Hardly any breaking at the bed*
- *Bed friction significant when Hs/h>0.15*
- *No relation between current velocity and wave friction*

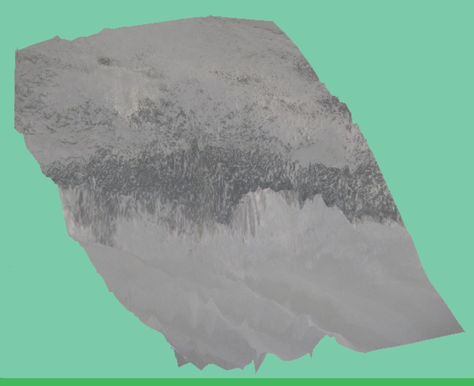
Modelling

- Wave model (SWAN)
- Calibration with field data

Creating input grids

Mapping to model grid:
- DGPS height map
- RWS data
- Mussel coverage

Grids with small grid spacing near and inside mussel bed.



Calibration

Measurements of:
- Wave heights
- Wave direction
- Orbital velocities

SWAN

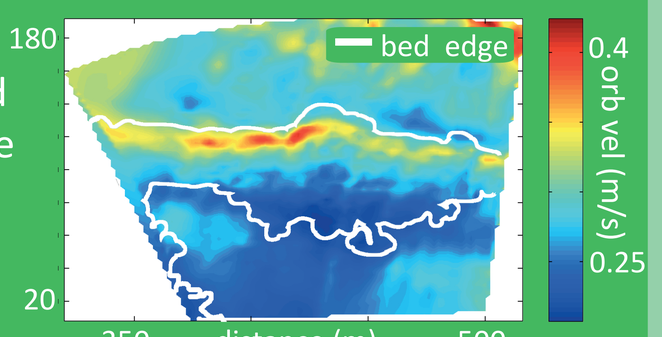
Boundary conditions
- Sea side wave heights
- Sea side wave period
- Sediment properties
- Wind (KNMI)

Results

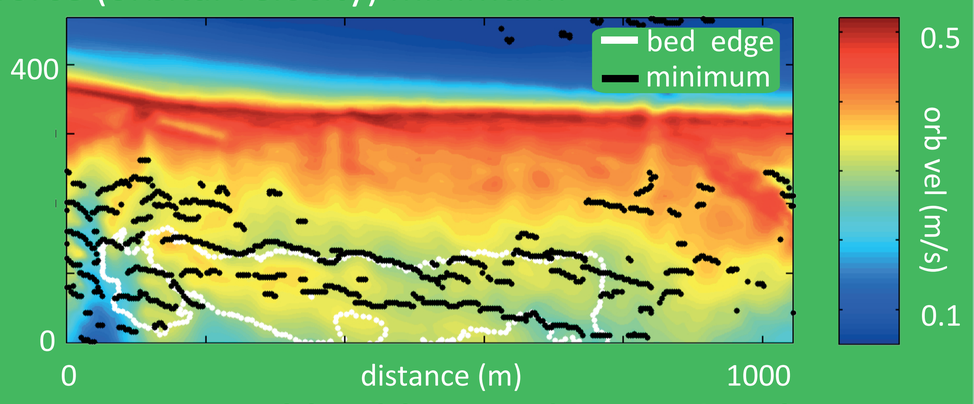
Wave forcing decreases over bed and increases shore ward of the bed.

Sea

Shore



Study on bathymetry before mussel settlement shows: Sea side edge of the mussel bed coincides with wave force (orbital velocity) minimum.



Mussel bed located in optimal location with respect to wave forcing

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