Efficient modelling of sand wave behaviour
Modelling of spatial and temporal variations in offshore sand waves

| process oriented       | - Luc Bijsterbosch  
<table>
<thead>
<tr>
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<th>- Suzanne Hulscher</th>
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<td>stochastic approach</td>
<td>- Joris van den Berg</td>
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<td>- Ruud van Damme</td>
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<td>Post doc. support</td>
<td>- Attila Németh</td>
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<td>- Michiel Knaapen</td>
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Overview

- What are the variations?
- Requirements on a model for variations
- Analysis of the modelling problem
- Preliminary new model
- Conclusions
What are the variations?

- **Temporal**: differences in growth rate
- **Spatial**: differences in wave length
- **Combinations**: shifting bifurcations
Requirements

- Large domain
- 2 horizontal dimensions
- Ability to describe sand wave development from arbitrary initial condition
Current vs. desired
Analysis

- Lack of speed mainly due to flow calculation
- Importance of linear growth
- Non linear limiting of growth
Linear growth

- Constant wave length dependent amplification
- Evolution of $h$ in fact exponential
- Good prediction of occurring wave lengths
Non linear growth limiting

\[ \frac{\partial h}{\partial t} = \mathcal{L}(h) - \mathcal{N}(h) \]

- Should not influence the wave lengths caused by linear growth
- Should result in the correct S shape growth curve

\[ \mathcal{N}(h) = h^3 \]
Intermezzo

Practical uses of speed
Dredging
Future outlook

- Current approach does not incorporate any flow physics
- Investigate which part of the flow physics is needed to describe the behaviour of sand waves
- Investigate the effect of random disturbances apart from the initial conditions