

Mathematical Physics

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- Modelling physical phenomena using (stochastic) (partial) differential equations:
- Analysis of the model (resonance)
 - Numerical simulation
 - Inverse modelling (parameter estimation)
 - Data assimilation (for real-time forecasting)

Related courses at TU Delft:

- Advanced modelling in Science
- Nonlinear differential equations
- Environmental simulation and data assimilation
- Computational aspect of stochastic differential equations

Examples of projects

- Modelling coastal sea pollution transport



Why modelling Environmental Transport?

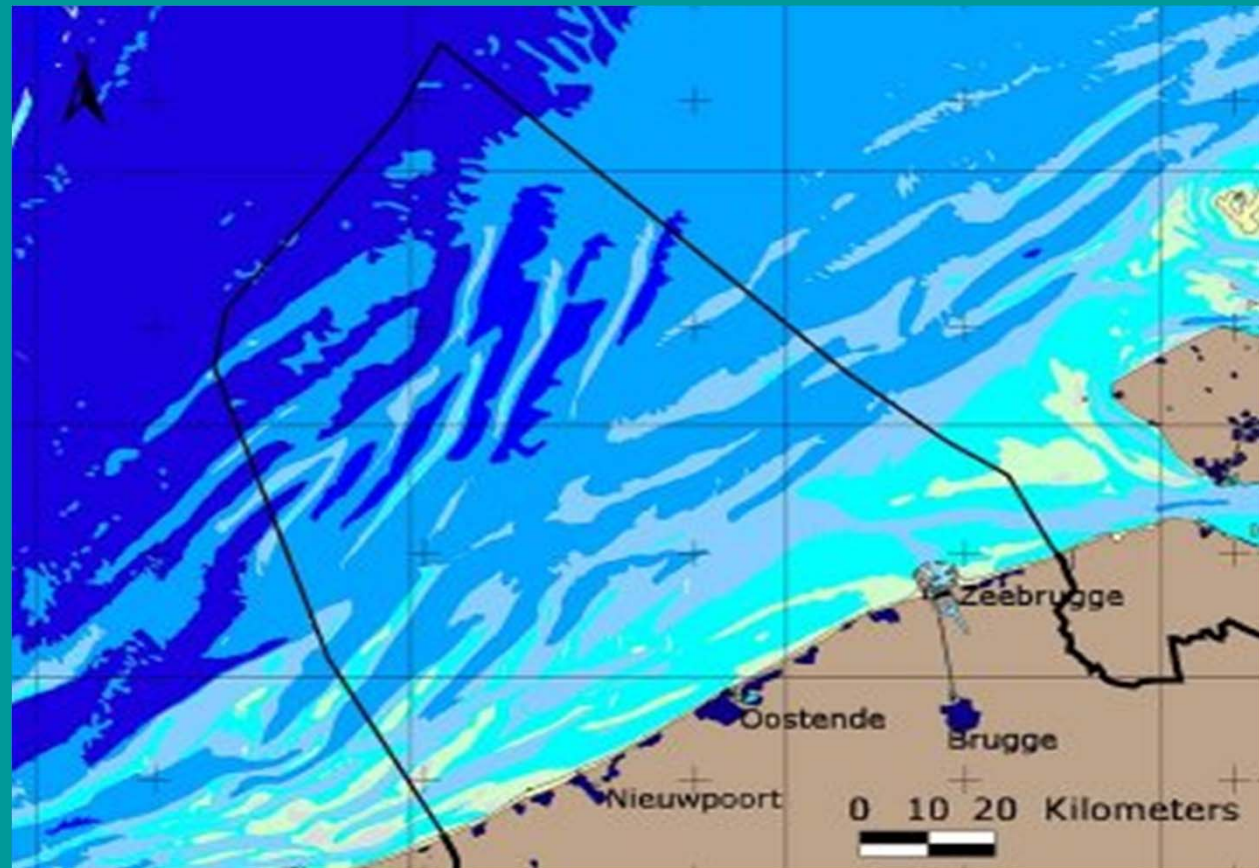
Examples of projects

- Modelling coastal sea pollution transport
- Modelling transport of sand (morphodynamics)

Small sand dunes on the beach



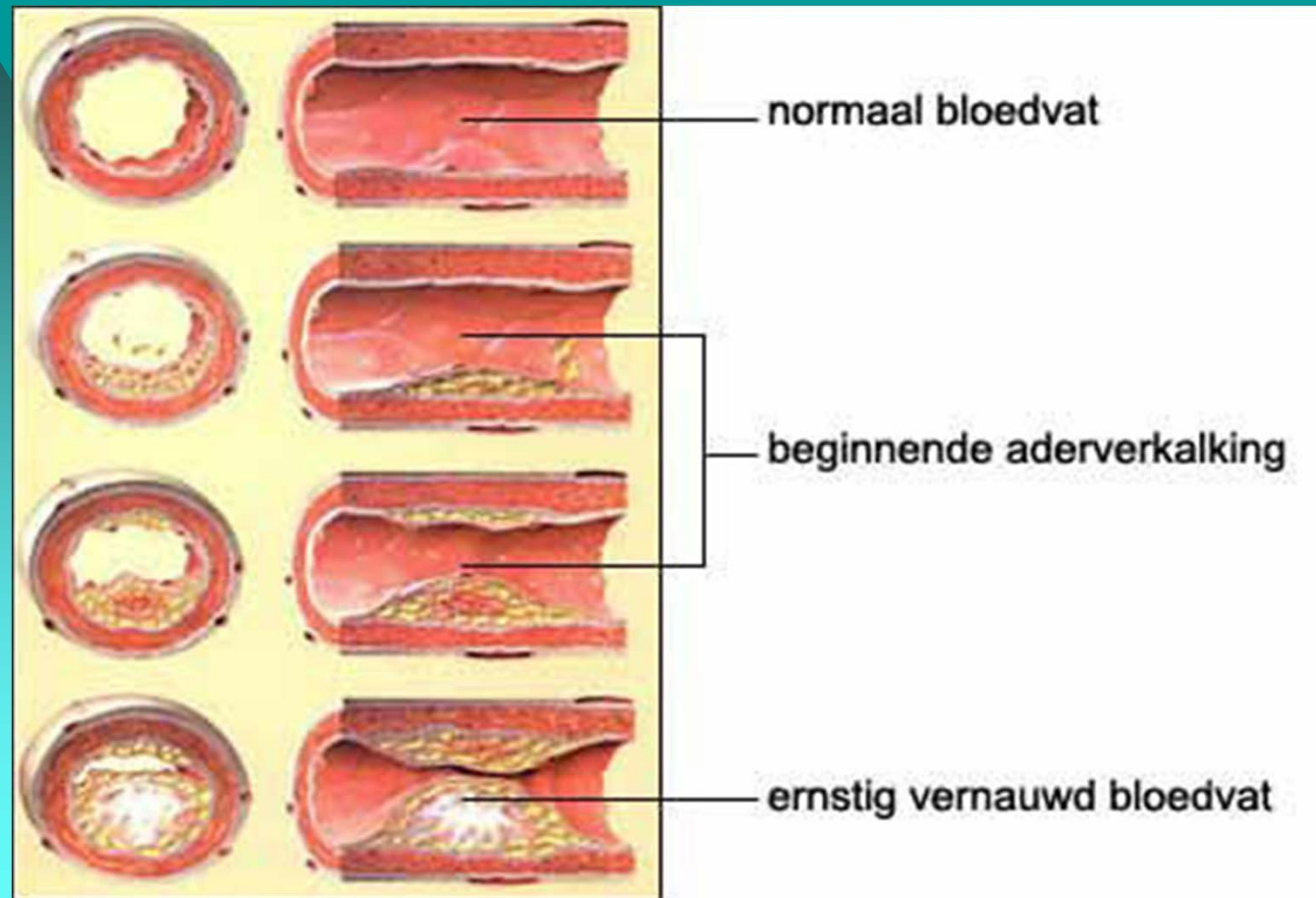
Large sand dunes along the North Sea coast



Examples of projects

- Modelling coastal sea pollution transport
- Modelling transport of sand (morphodynamics)
- Modelling atherosclerosis

Atherosclerosis



Examples of projects

- Modelling coastal sea pollution transport
- Modelling transport of sand (morphodynamics)
- Modelling atherosclerosis
- Estimation permeability field in oil reservoir models

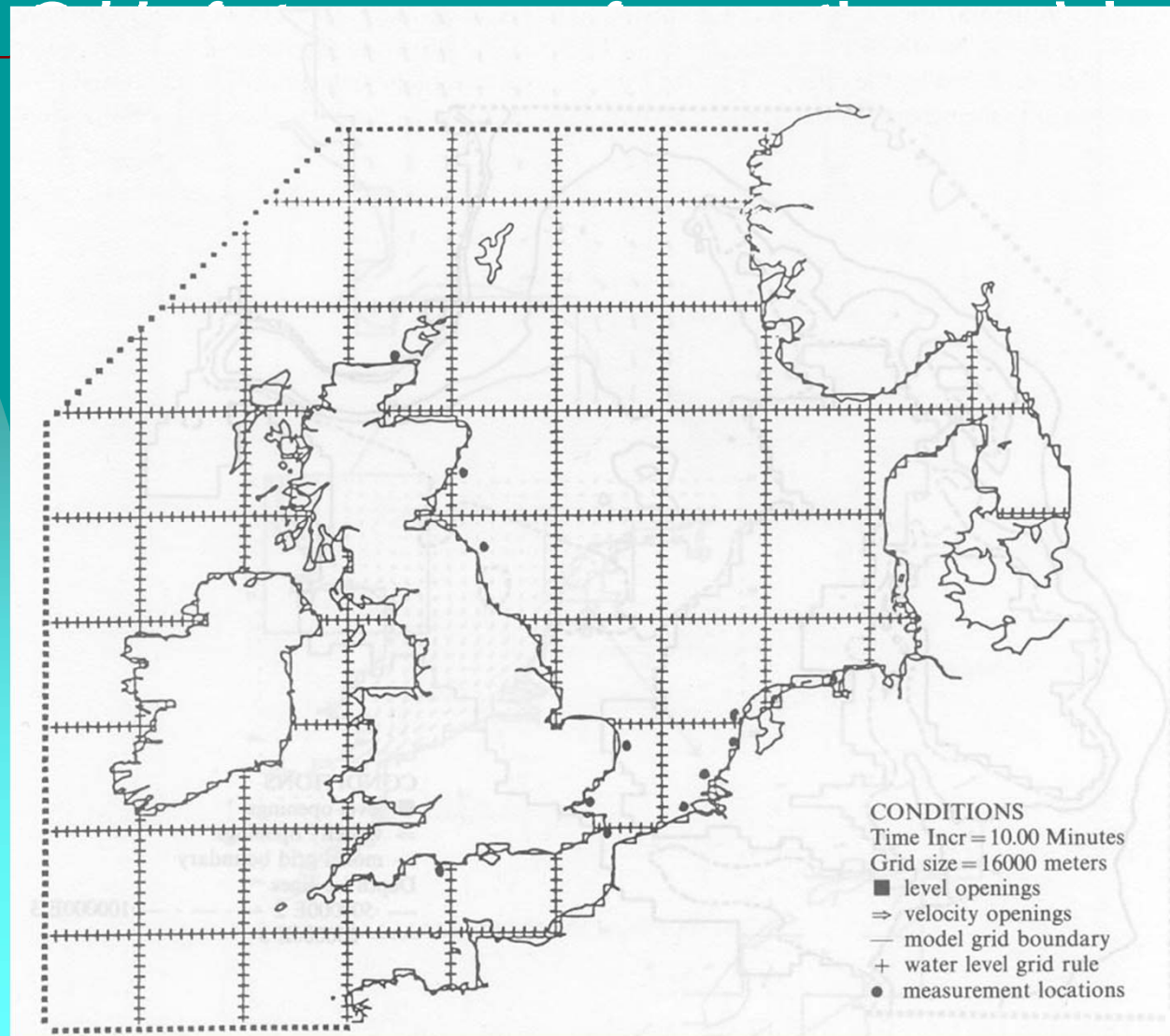
Examples of projects

- Modelling coastal sea pollution transport
- Modelling transport of sand (morphodynamics)
- Modelling atherosclerosis
- Estimation permeability field in oil reservoir models
- Real-time forecasting of waterlevels and tidal flows

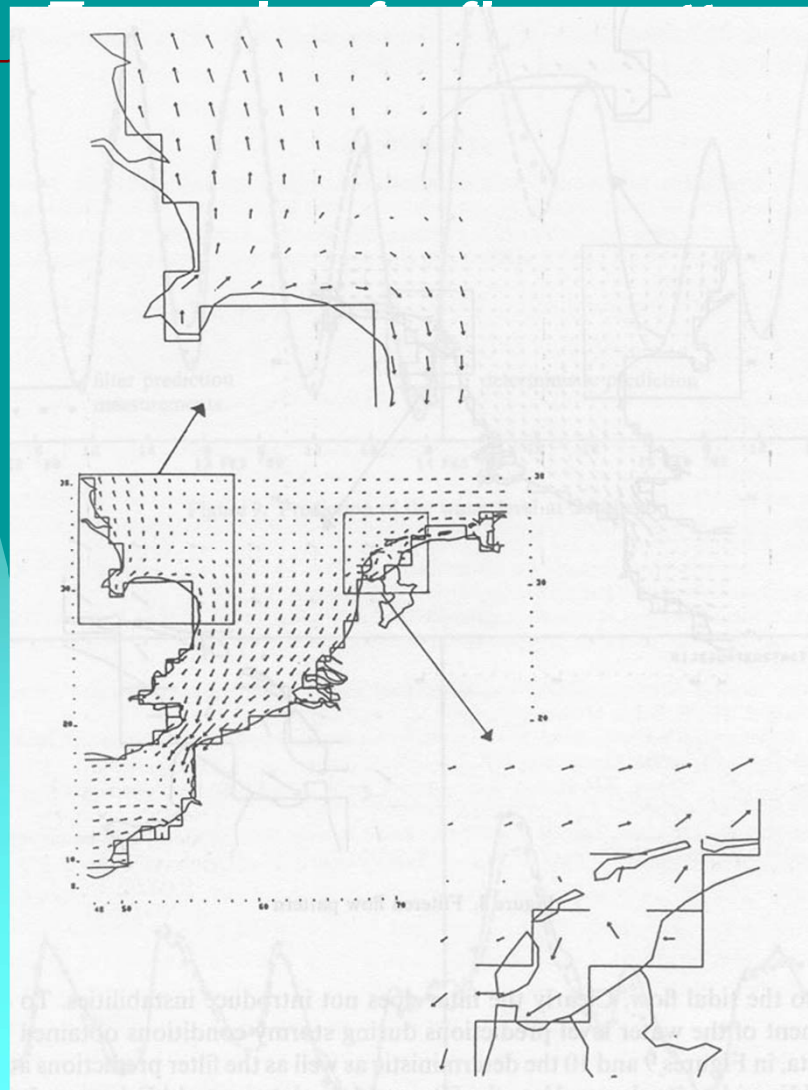


Why forecasting water levels?

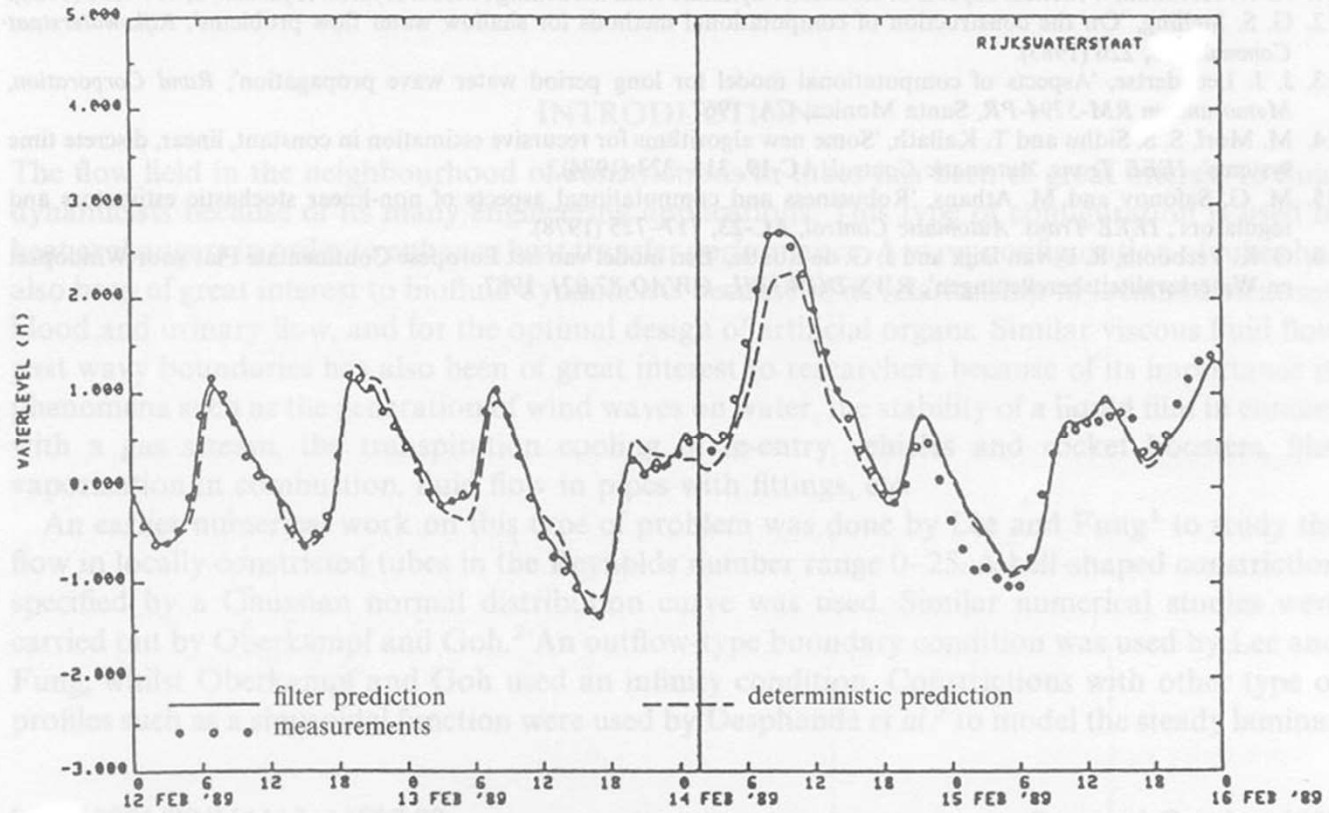
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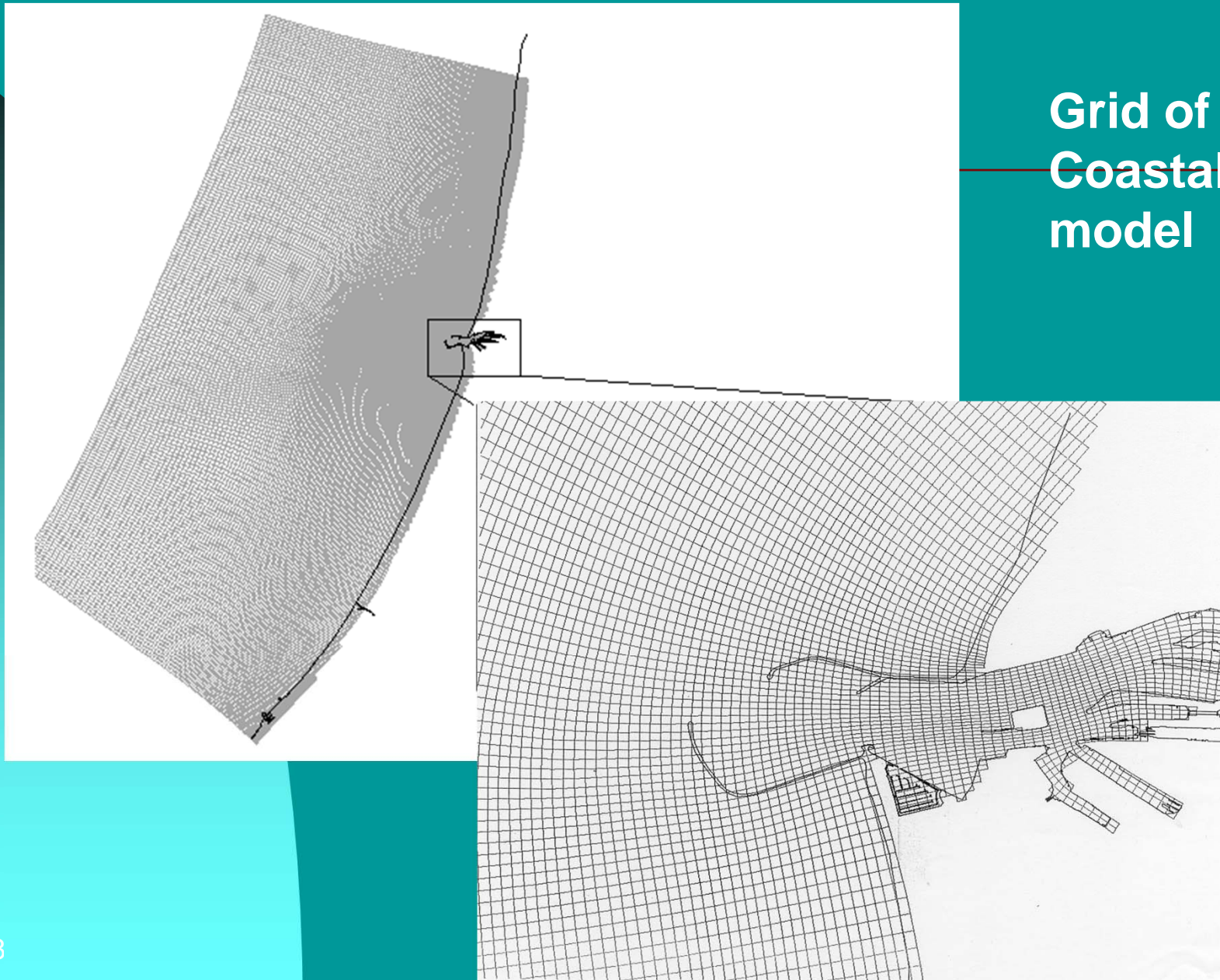


Example of a water level forecast



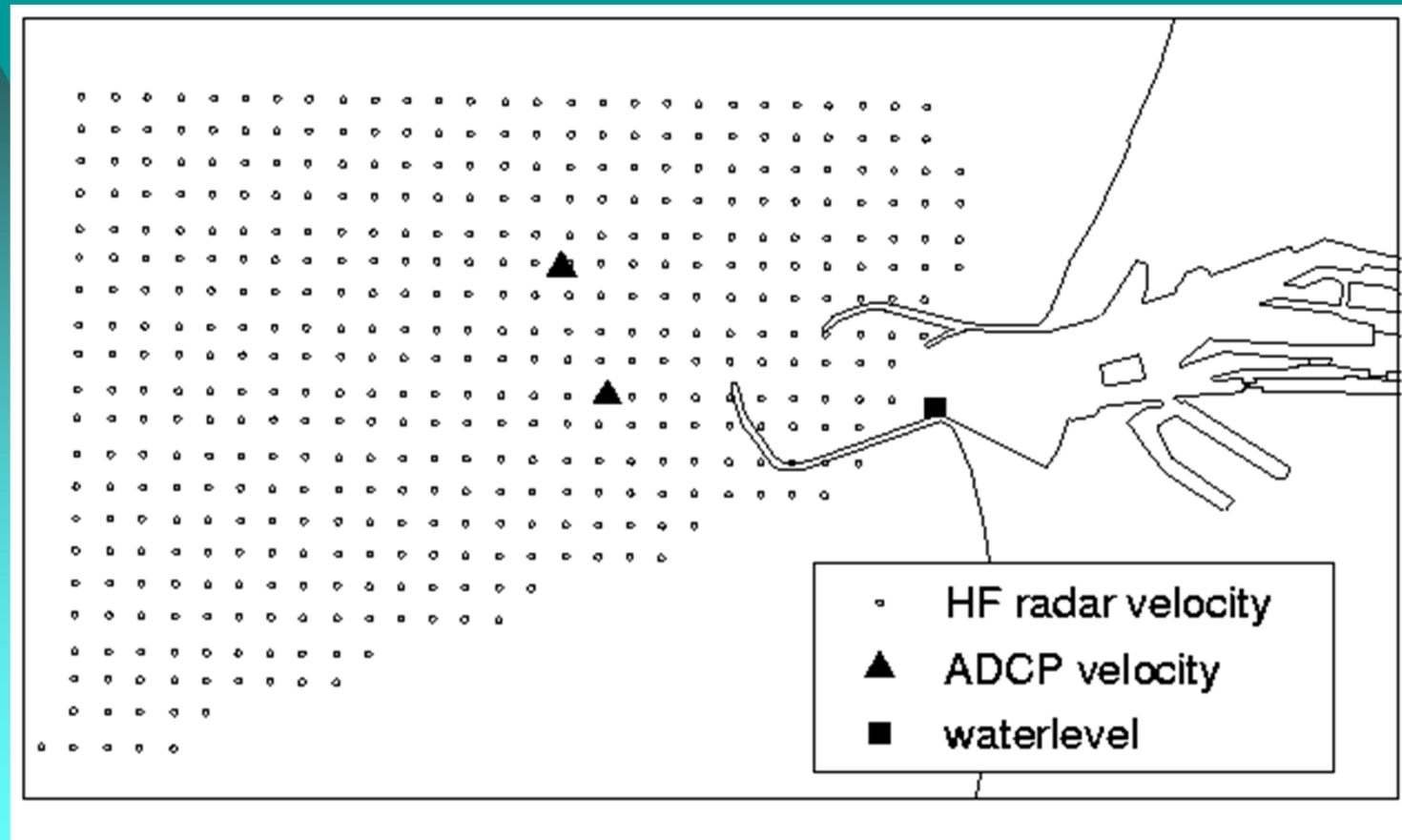
Prediction of the water level at Ijmuiden

Grid of Coastal model

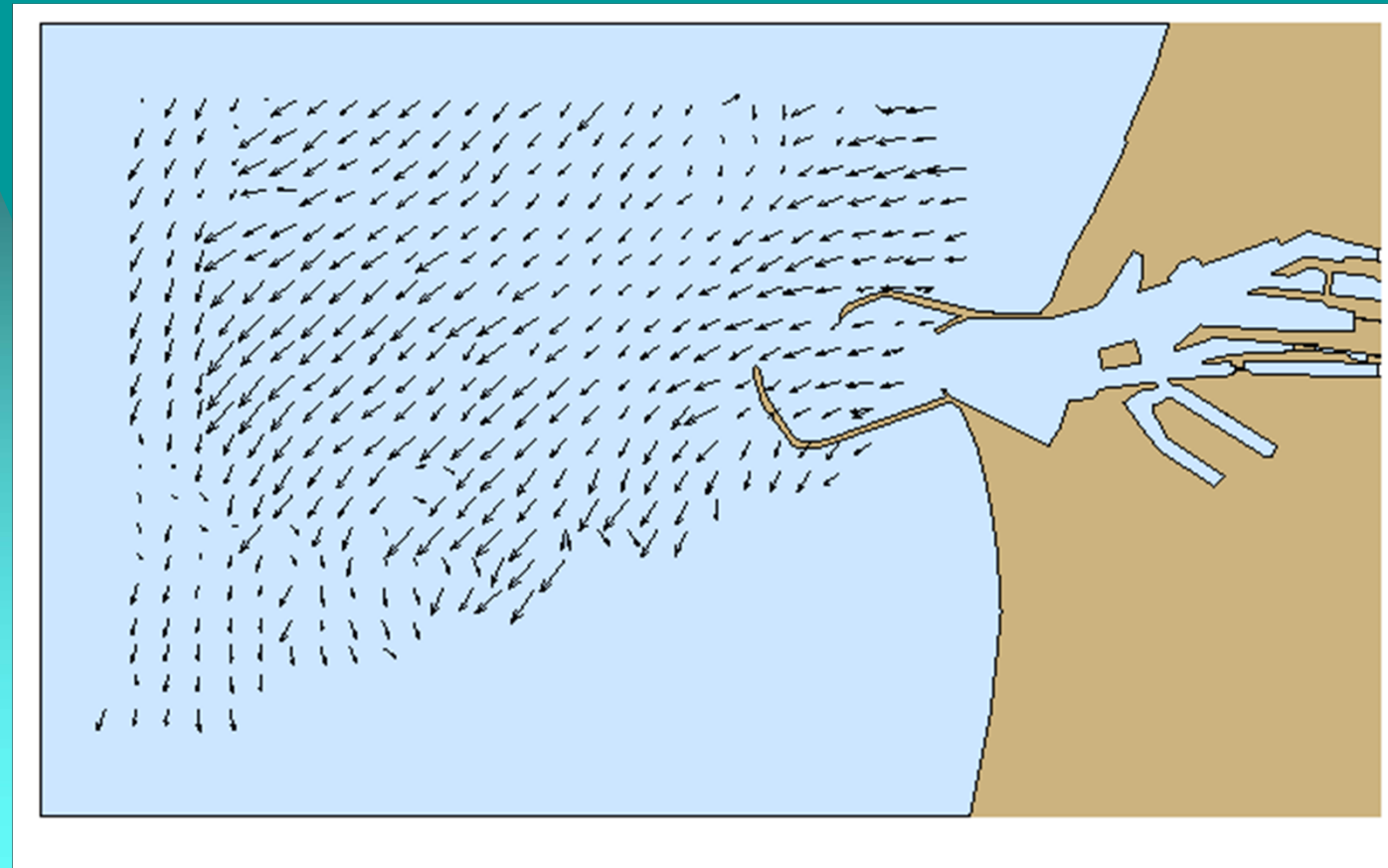


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Data locations

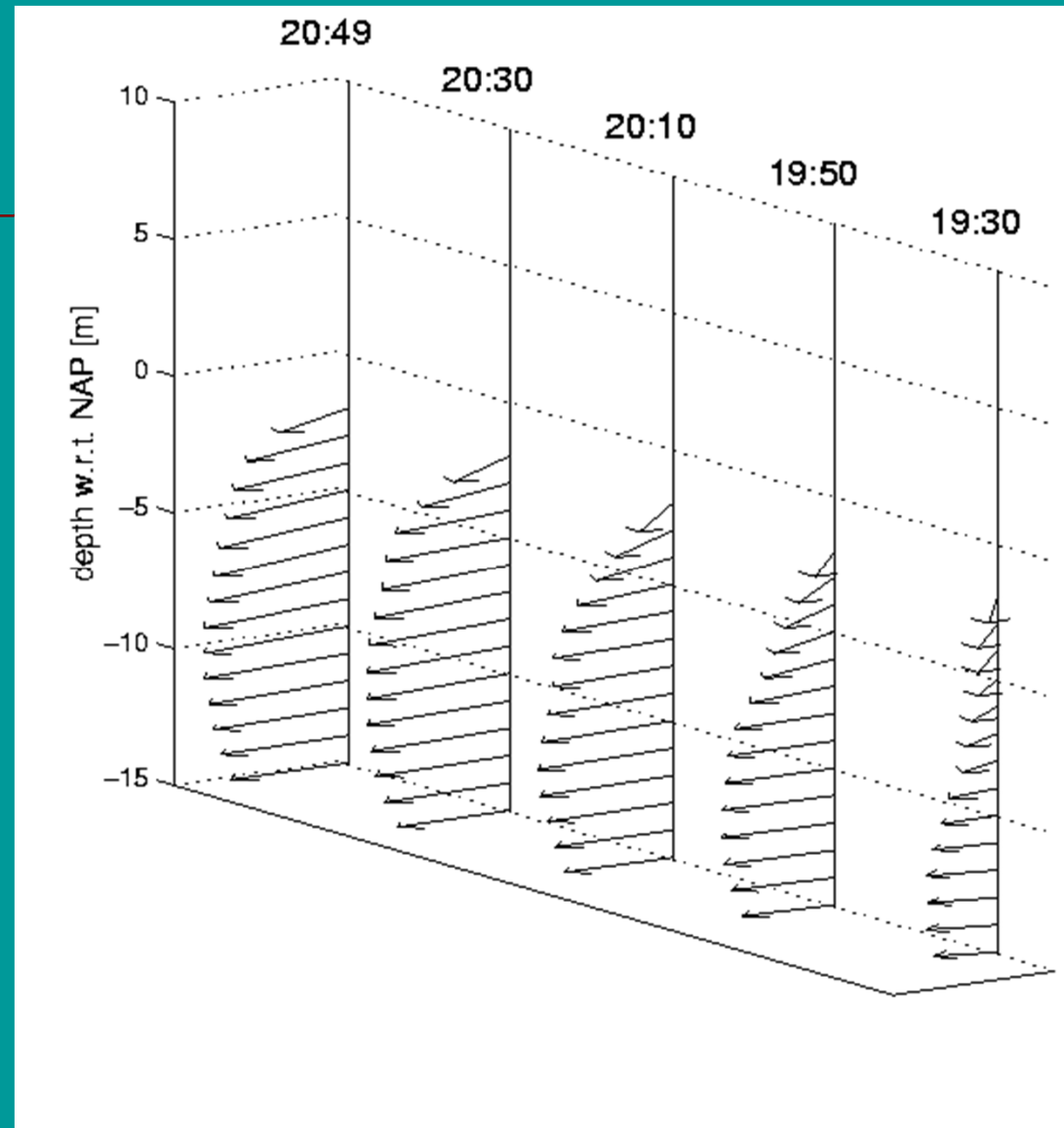


HF radar data



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Measurements of the vertical velocity profile



Examples of projects

- Modelling coastal sea pollution transport
- Modelling transport of sand (morphodynamics)
- Modelling atherosclerosis
- Estimation permeability field in oil reservoir models
- Real-time forecasting of waterlevels and tidal flows
- Estimation of emissions in air pollution models