wl | delft hydraulics

2DH Quantification of Subtidal Bathymetry

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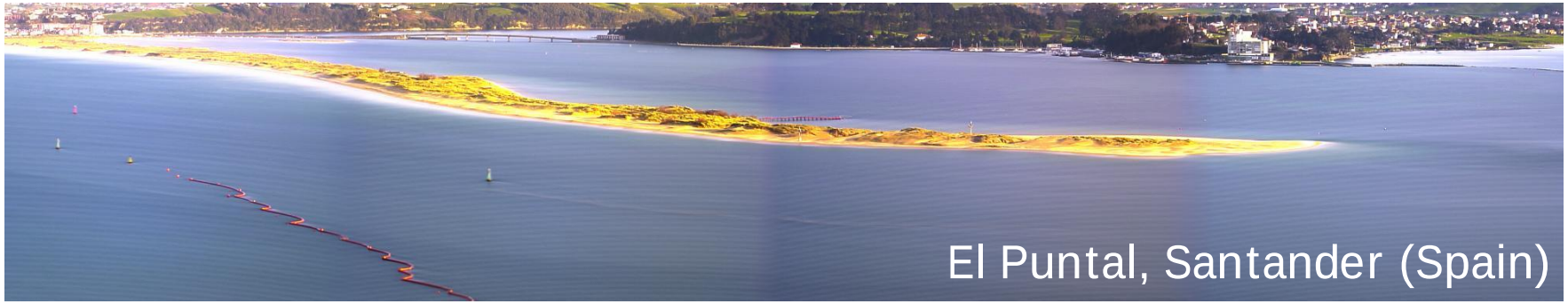
NCK Days Yerseke, March 18-19, 2004

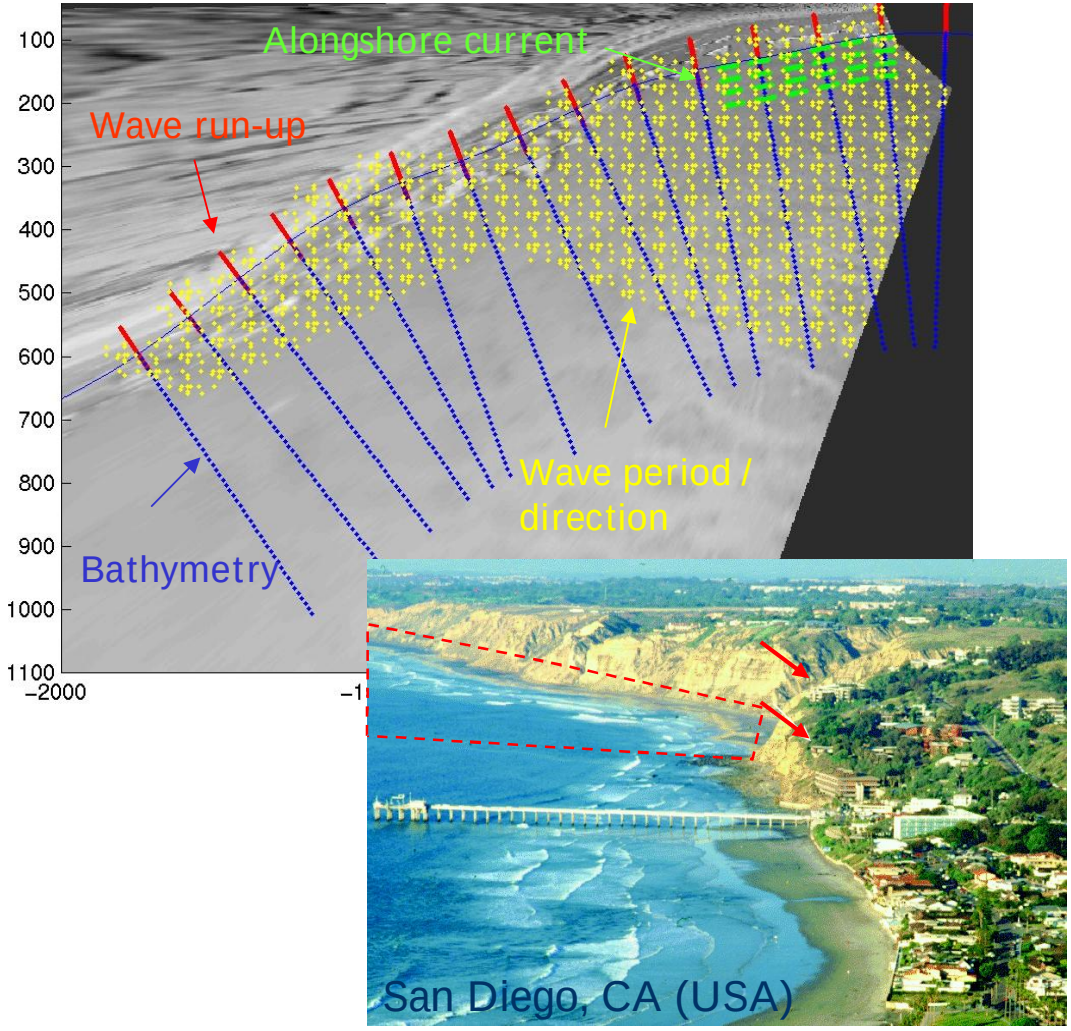
Overview of this talk

- **Quantification of subtidal bathymetry**
- **Integration of Argus and Delft3D**
- **Pilot applications**
  - **Rip current system at Monterrey (CA), USA**
  - **Nourished beach at Egmond (NL)**



Approach (Option 1)

Quantification of surfzone bathymetry (SH'98)



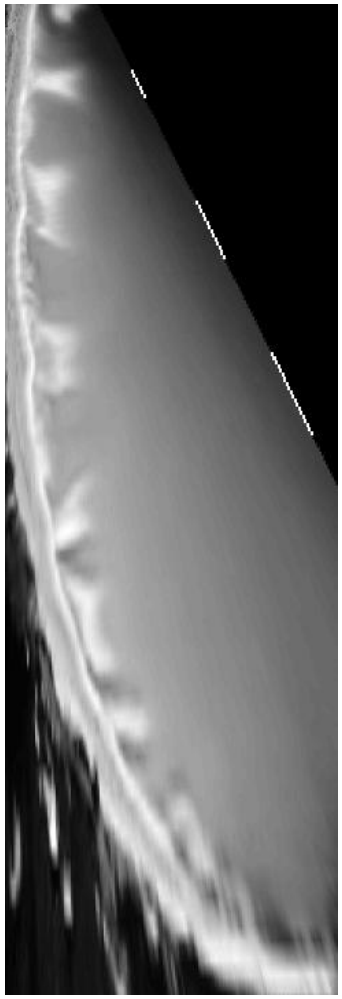
Collection of pixel Intensity time series at Nearshore Canyon Exp. San Diego (CA), USA (Figure courtesy of OSU)

Stockdon and Holman (1998) quantify local water depth from video-derived estimates of phase velocity

Approach (Option 2)

Quantification of surfzone bathymetry (ARRK'03)

Argus video



Wave model

Time-averaged video observations vs. model simulations of breaking waves at Palm Beach, Australia (after: Reniers et al., 2001)

We aim to update sub-tidal beach bathymetry through assimilation of video-observed and model-predicted patterns of wave dissipaton

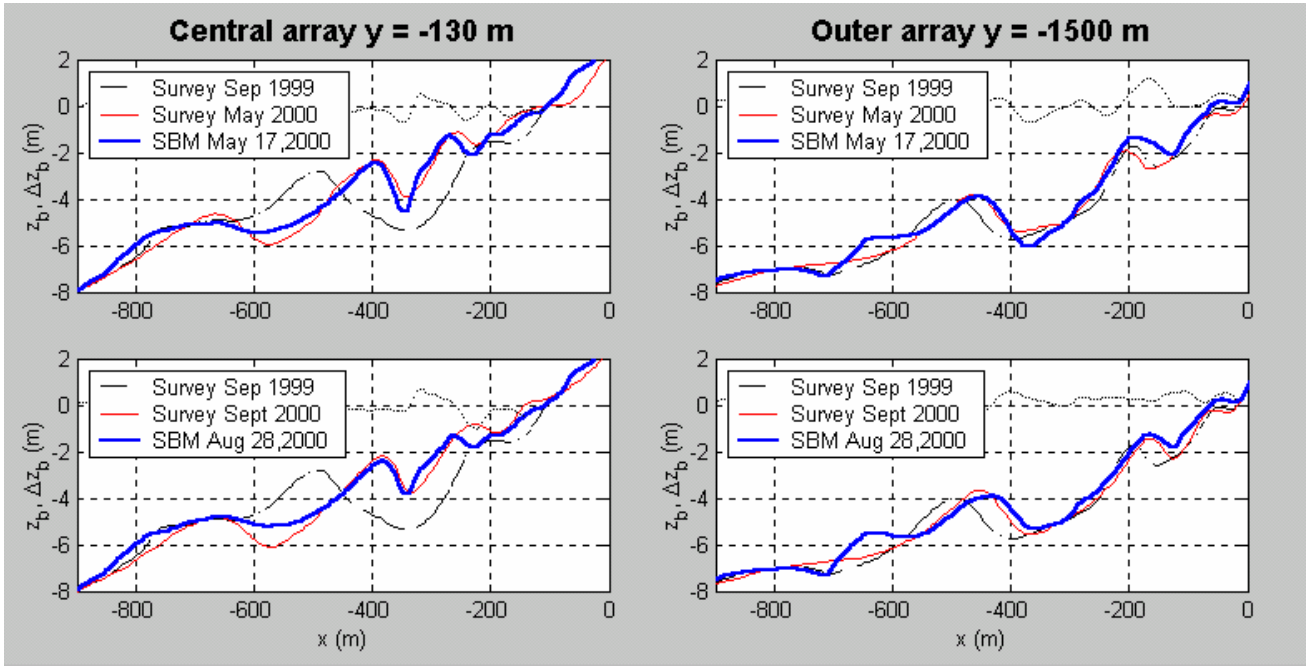
Subtidal Beach Mapper (1D)

Application: beach/shoreface nourishment

- **Two arrays spacing 1400 m (Egmond)**
- **Use of 700 - 1000 images over period Sept. 1999 – Sept. 2000**

Model performance

- **Accuracy: 10 to 20 cm at seaward bar face, 20 to 40 cm near bar crest and up to 80 cm in trough region**
- **Lack of RS info in trough regions**
- **Uniform beaches (no rips!)**
- **Single camera only**



Thus: Subtidal Beach Mapper (2DH)

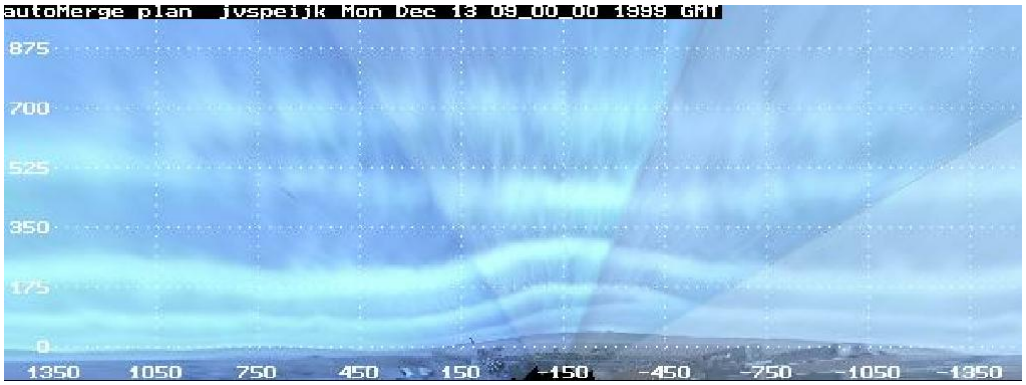
Innovative aspects

- **Interpretation of plan view merges**
- **Integration of Argus and Delft3D (implementation of assimilation code)**

Pilot Applications

- **Model test synthetic data (not presented here)**
- **RIPEX experiment Monterey Bay (CA), USA**
- **Shoreface nourishment Egmond (NL)**

Image interpretation



Plan-view merge (standard image)

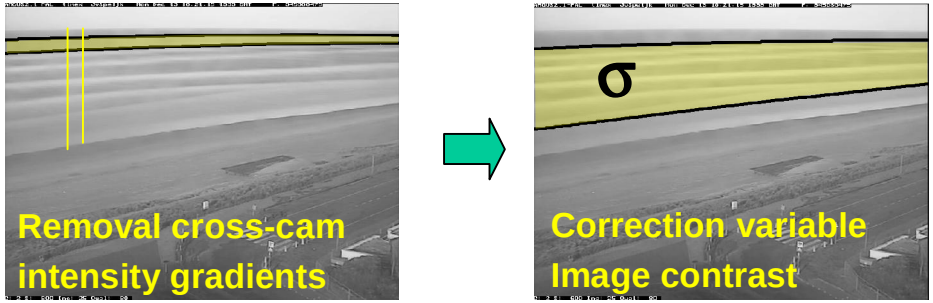
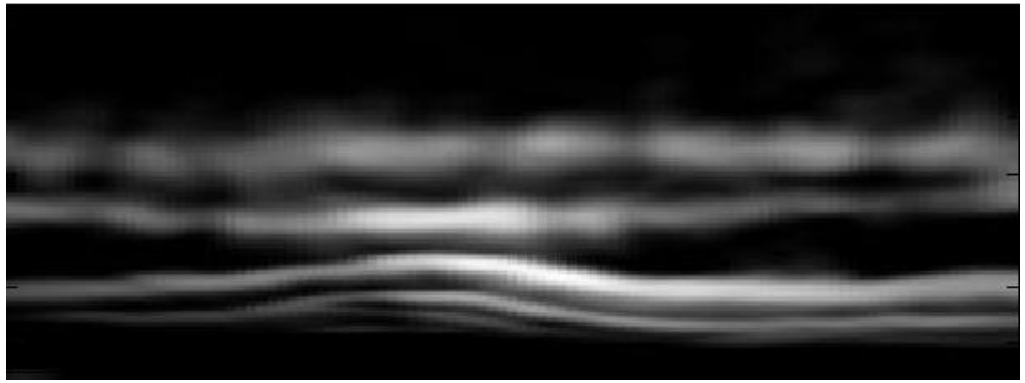


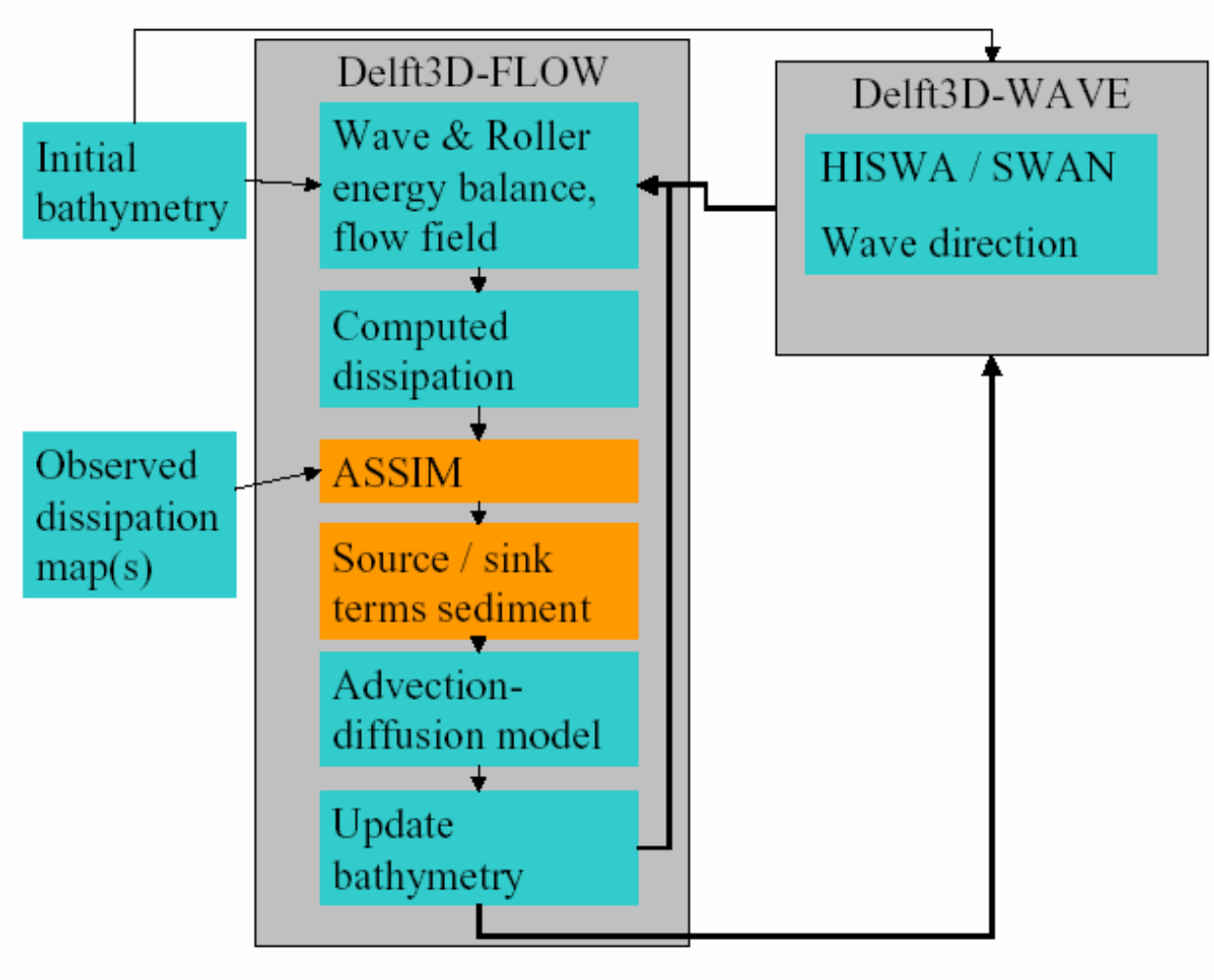
Image interpretation Two-step approach



Corrected intensity map after scaling with incoming energy flux)

Argus and Delft3D

Implementation of assimilation code

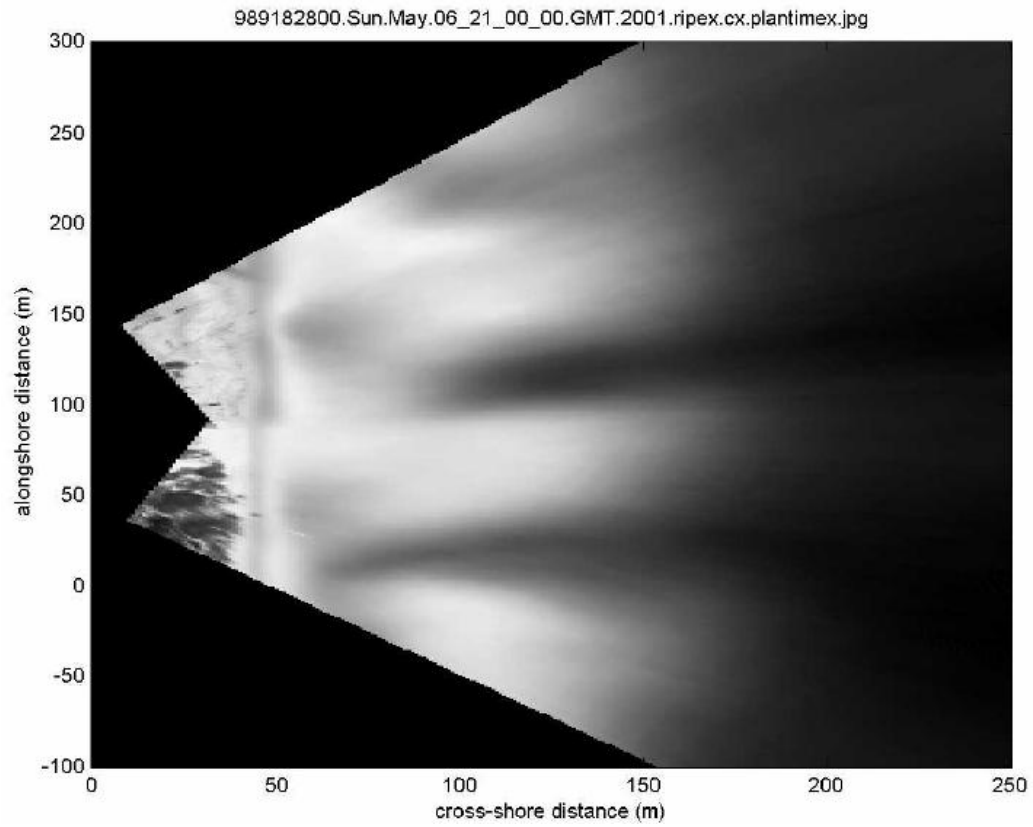


Key components

- **Directional wave model**
- **2D roller model**
- **2D diffusion model for redistribution sediment**

RIPEX application

RIPEX experiment Monterey Bay (2001)

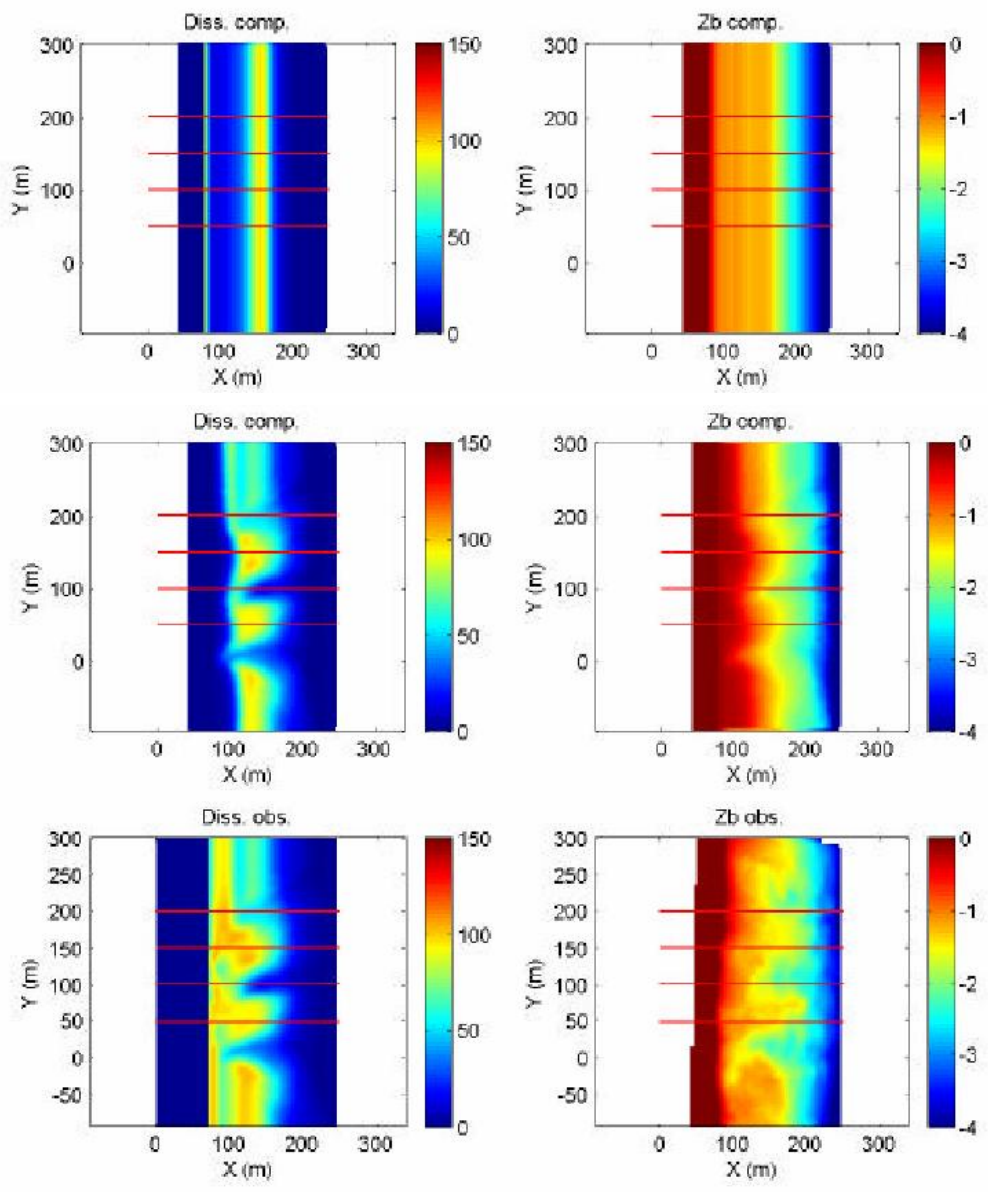


Single camera

Single image

- **Figure courtesy of Nathaniel Plant**
- **Details on experiment: Reniers et al., ICCE 2002**

RIPEX application



Initial bathymetry + computed dissipation

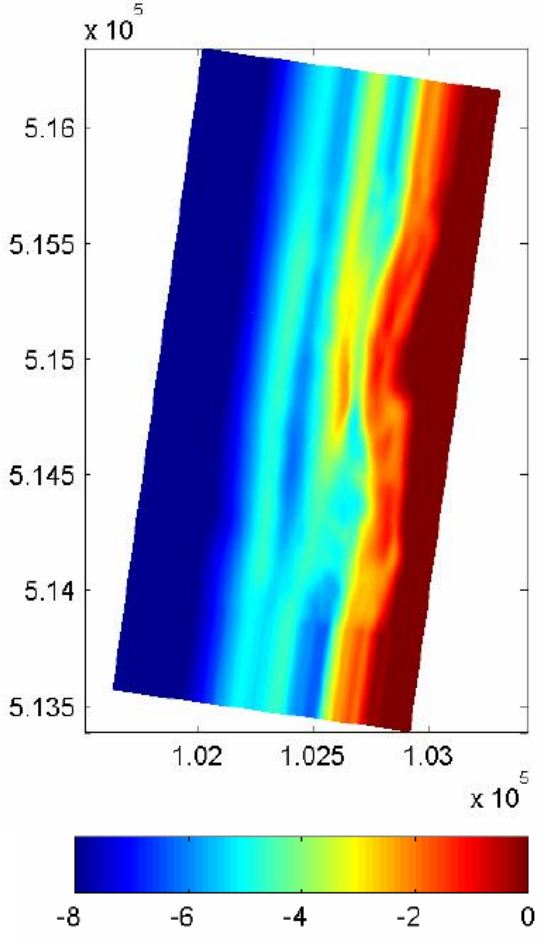
Computed bathymetry after assimilation

Measured bathymetry + observed dissipation

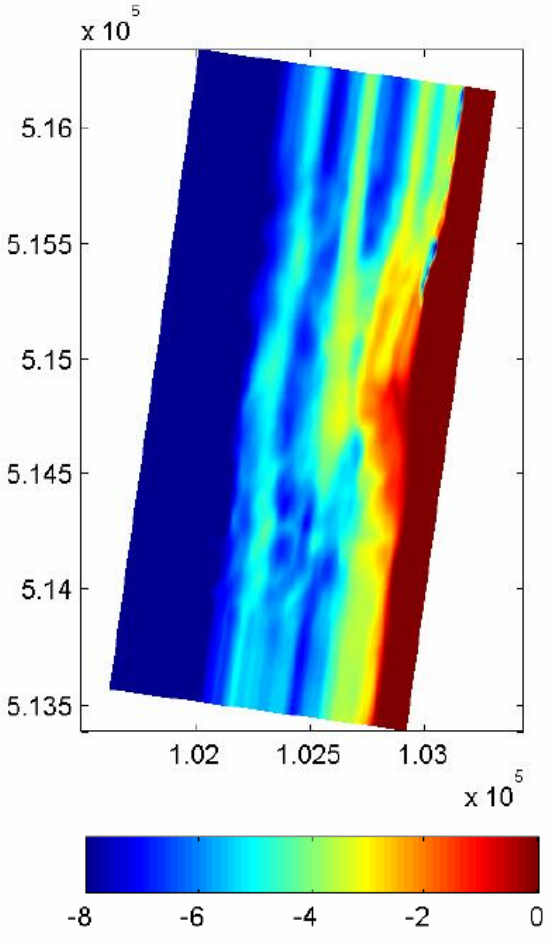
Egmond application

Shoreface nourishment Egmond (NL)

Measured



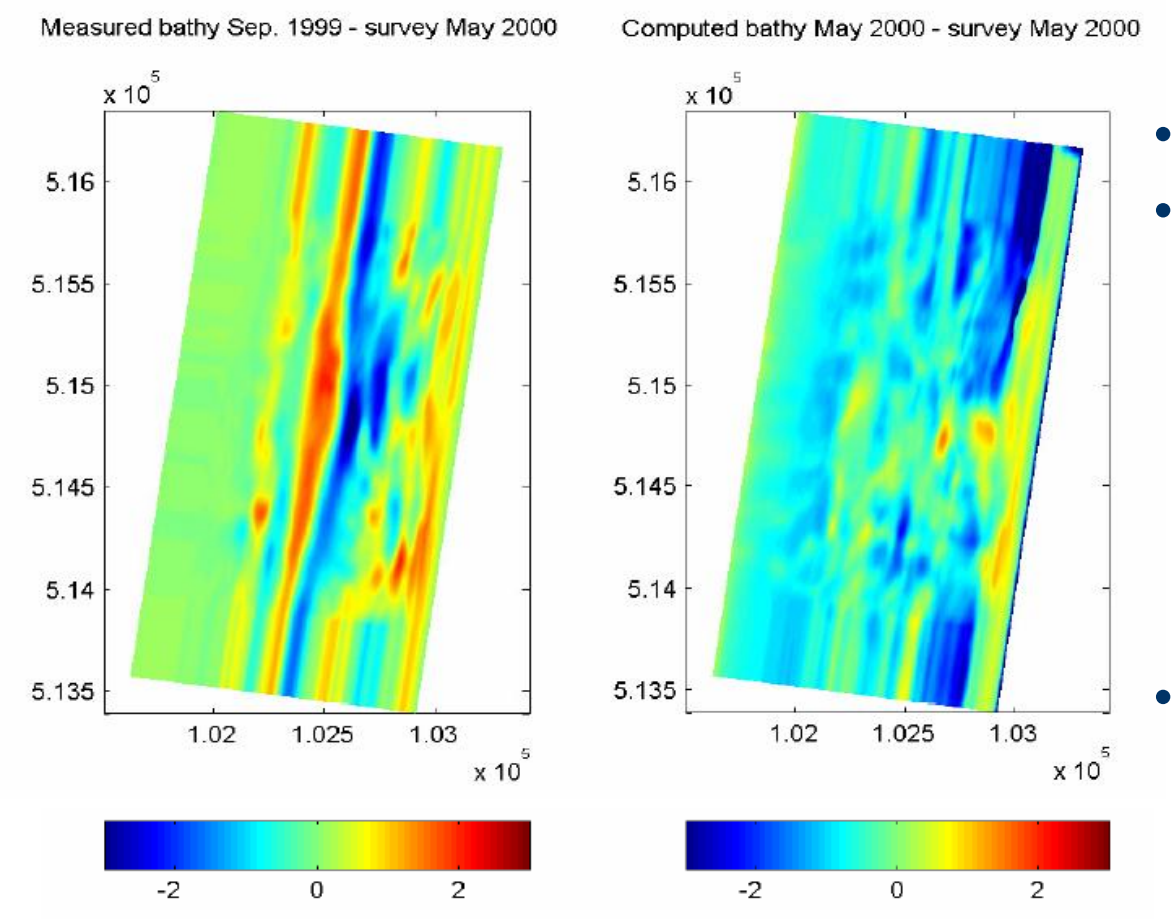
Computed



- **Initial bath. Sept. 1999**
- **Final bath. May 2000**
- **Limited number of manually picked images**
- **Model not calibrated yet**

Egmond application

Potential of SBM-2DH (1): Better resolution in time



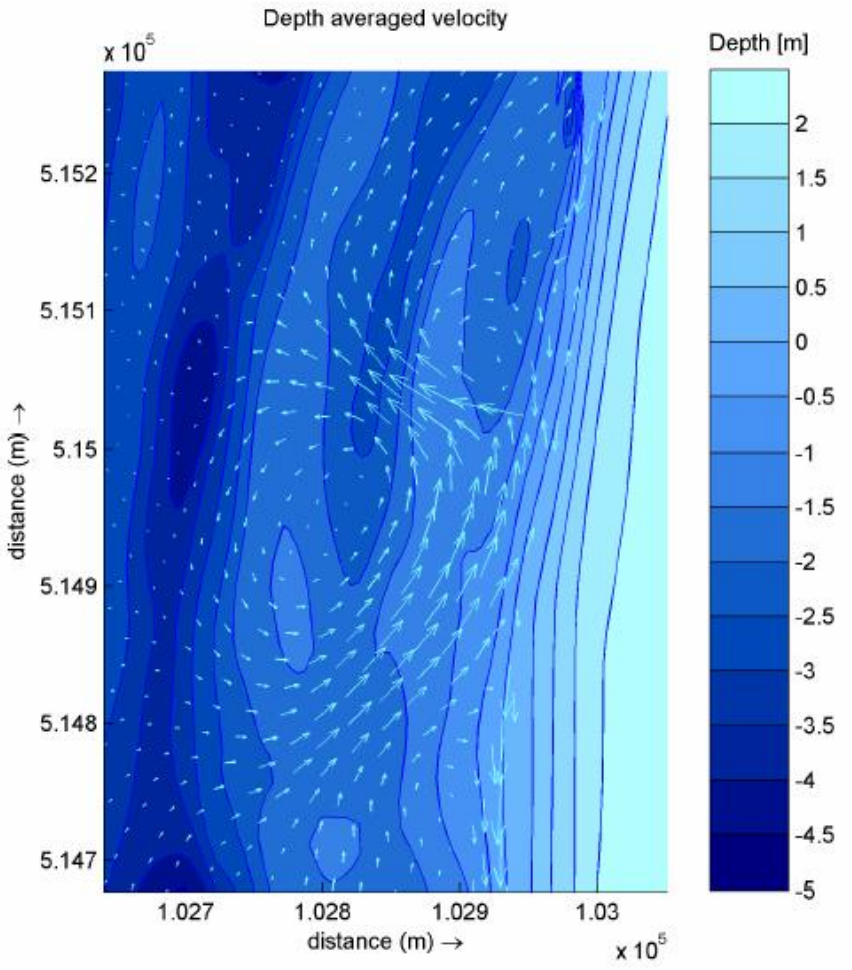
Scenario A

Scenario B

- **Initial bath. Sept. 1999**
- **Need bath. May 2000**
  - **Scenario A: Assume Sept.99 survey = best estimate**
  - **Scenario B: Use Argus to improve May 2000 estimate**
- **Scenario B considerably better**

Egmond application

Potential of SBM-2DH (2): Rip Currents

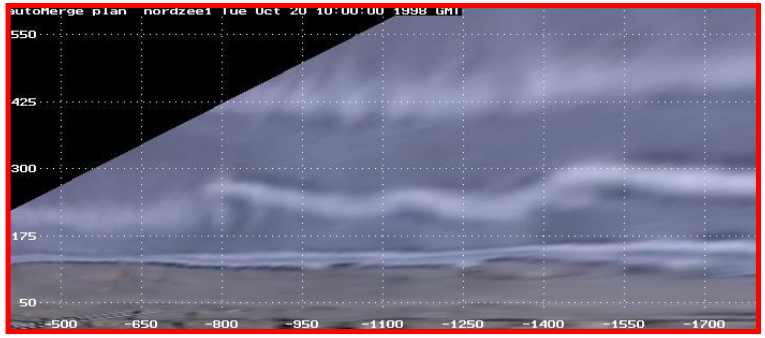


DMI Argus-Delft3D

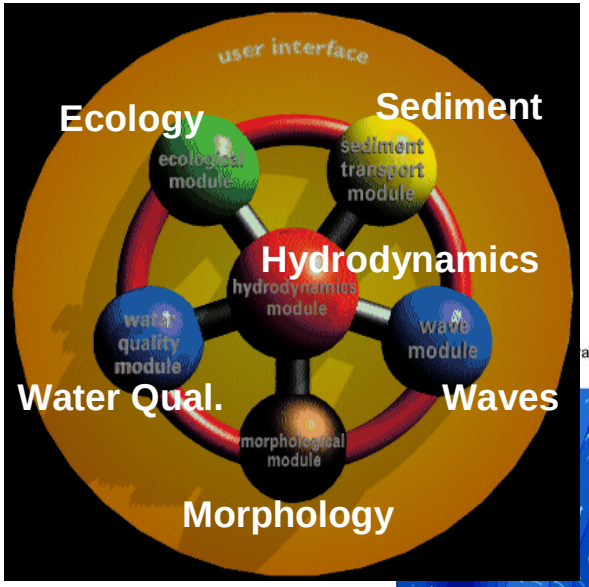
Real-time monitoring of coastal processes

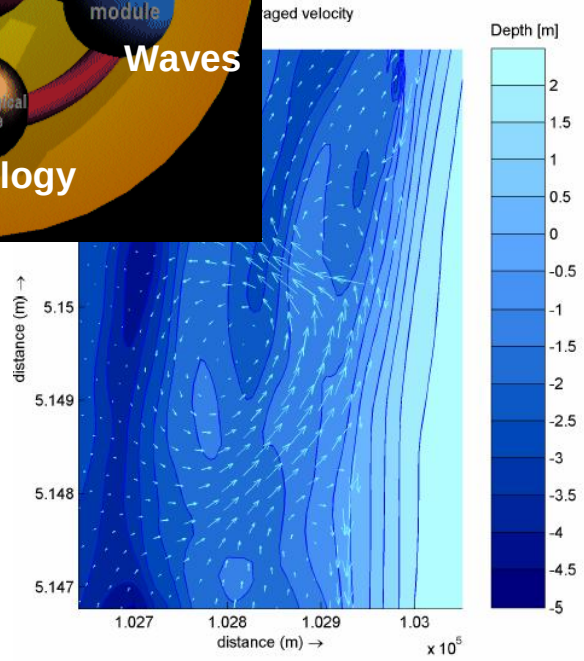
The Argus video technique

Plan view image



Delft3D Morphological Model





In summary

- **Video interpretation model yields smooth maps, though far-field dissipation rates underestimated**
- **Bathymetry assessment methodology successfully embedded in Delft3D environment**
- **Pilot applications with non-calibrated model demonstrate potential of technique**
- **DMI applications (real-time monitoring) subject to future research**

Questions?