Deltares

Enabling Delta Life

On the potential benefits of using scatterometer data in the North Sea operational coastal wave forecasting system

Martin Verlaan and Sofia Caires

Utrecht, 14 June 2012

Outline

- Framework
- Motivation and goal
- Data description
- Comparisons
- Conclusions
- Future work

Deltares

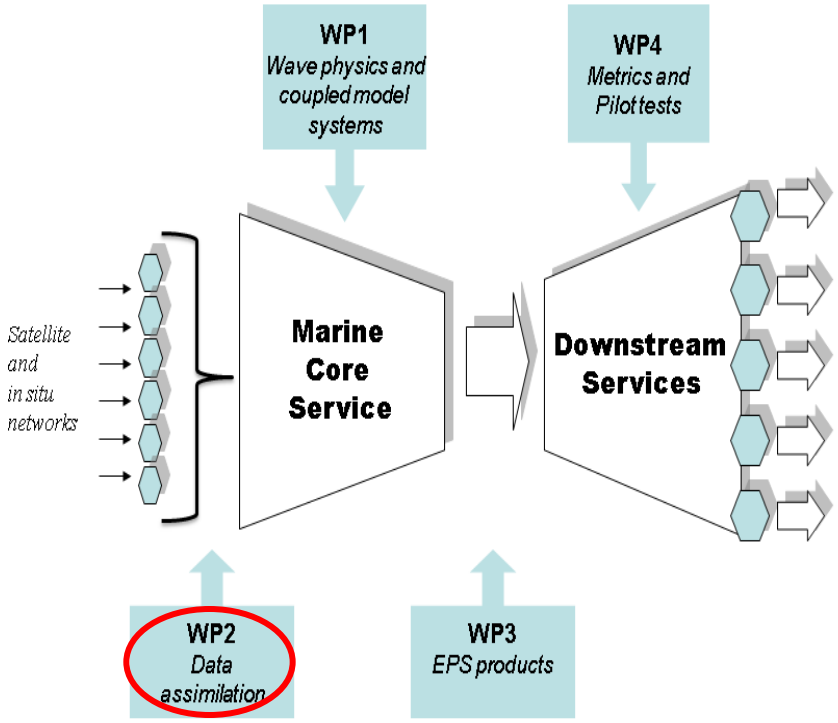
Framework 1/2

MyWave: towards a pan-European concerted and integrated approach to operational wave modelling and forecasting – a complement to GMES *(Global Monitoring for Environment and Security)* MyOcean services

The main goal of **MyWave** is to lay the foundation for a future Marine Core Service that includes ocean waves.

To reach this goal we will

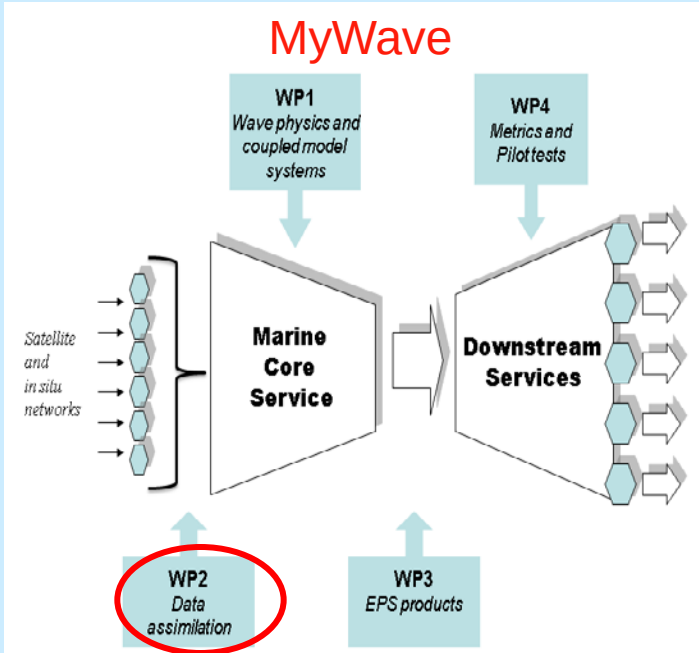
- increase the use of earth observations by improving data processing algorithms and data assimilation systems (WP2),
- improve the physics in current wave models and provide a framework for coupled model systems (atmosphere/waves/ocean) (WP1),
- establish a new standard for probabilistic wave forecasts based on ensemble methods (WP3),
- derive standard protocols for validation products (WP4).



Framework 2/2

MyWave tasks involving scatterometer data

- Subtask 2.1.3: Assimilation of more than one parameter in the Southern North Sea operational system using ensemble Kalman filters (Deltares)
- Subtask 2.2.1: Near-shore scatterometer wind product (KNMI)
- Subtask 2.2.2: Near-shore wind forecasts with assimilation of near-shore scatterometer (KNMI)
- Subtask 2.2.3: Cross-validation of satellite data, in-situ observations and wave-forecasts (ISMAR, Deltares, PdE+AEMET, KNMI)

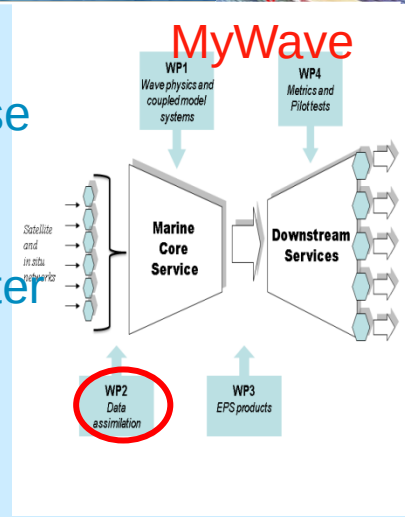


Motivation and goal 1/n (initial steps)

Motivation

One of the aims of the European MyWave project is to improve the use of nearshore satellite data in nearshore wave forecasting.

Consequently, in the framework of this project, nearshore scatterometer wind fields are to be assimilated either in the atmospheric models (KNMI) producing forcing winds for the wave models or directly in the wave models (Deltares).



Objectives

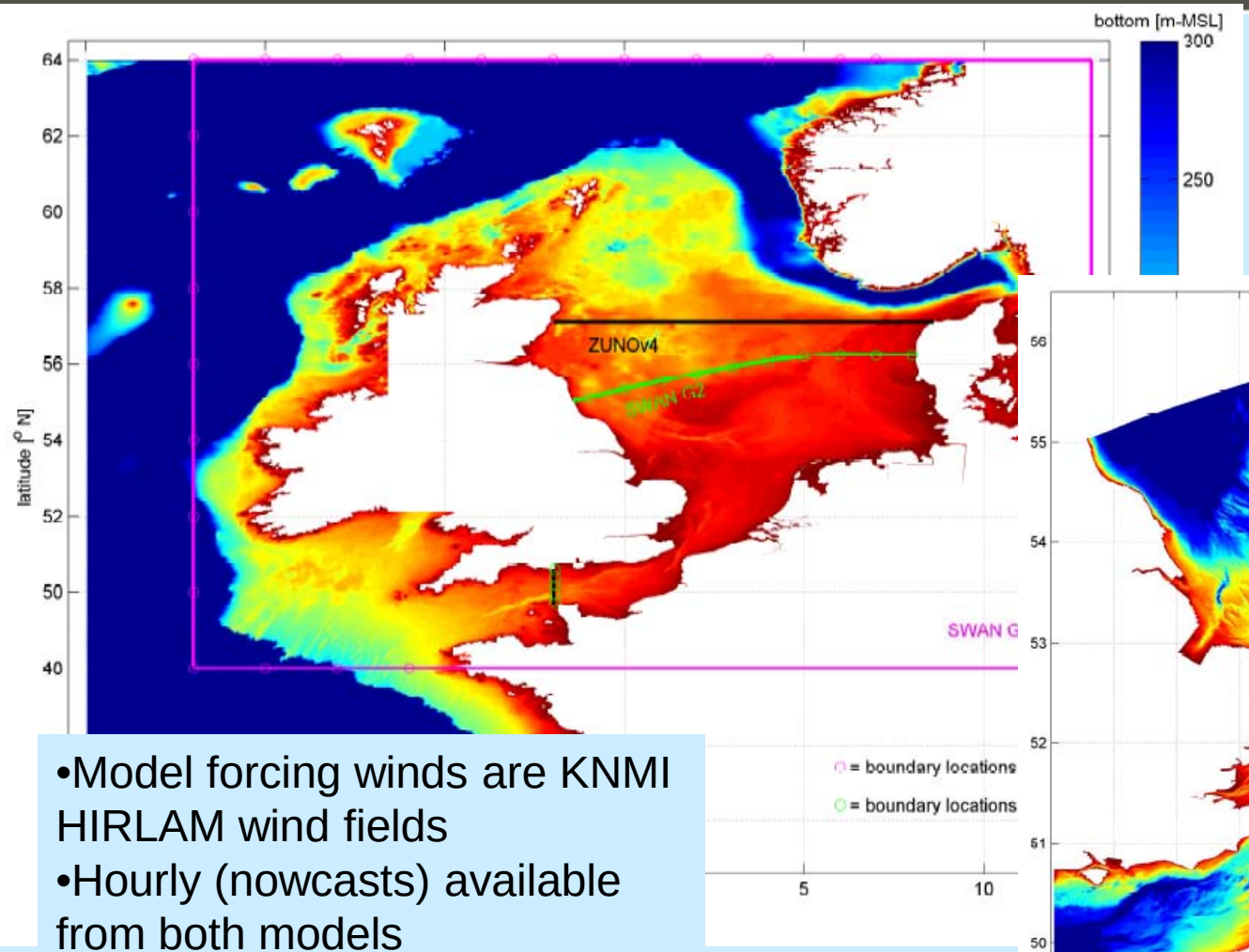
With the goal of identifying the potential effect of the use of nearshore scatterometer wind fields in the quality of the North Sea operational coastal wave forecasts,

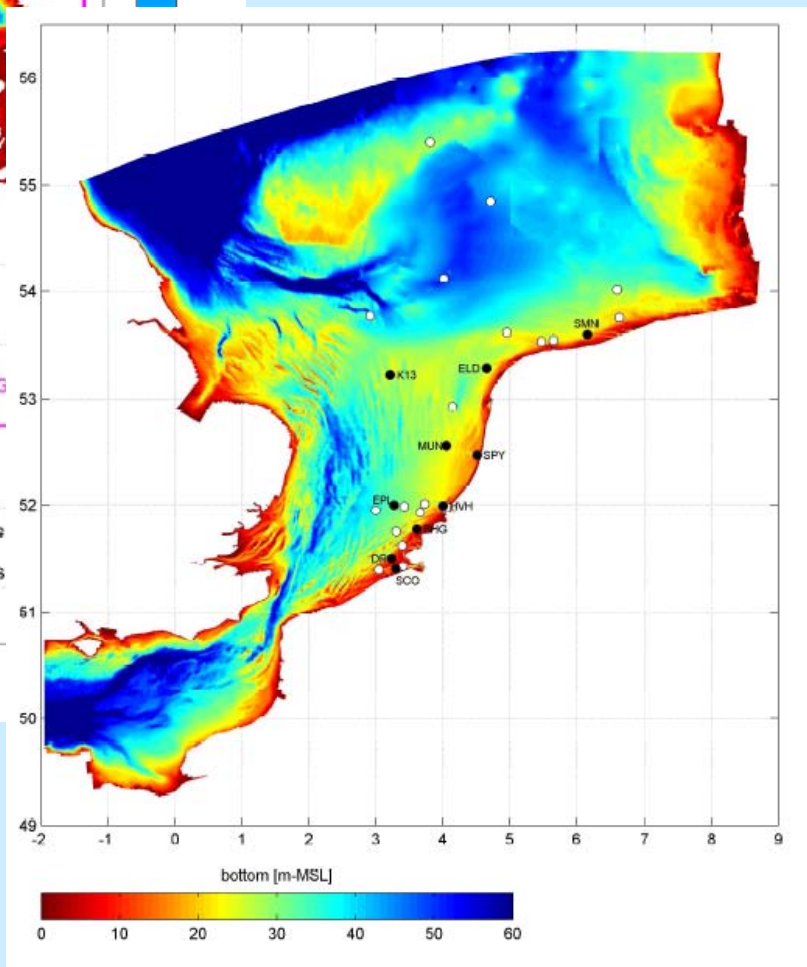
scatterometer data have been collocated and compared with

- in-situ wind measurements,
- the operationally used model forcing wind fields
- and the corresponding wave model results and
- wave measurements.

Deltares

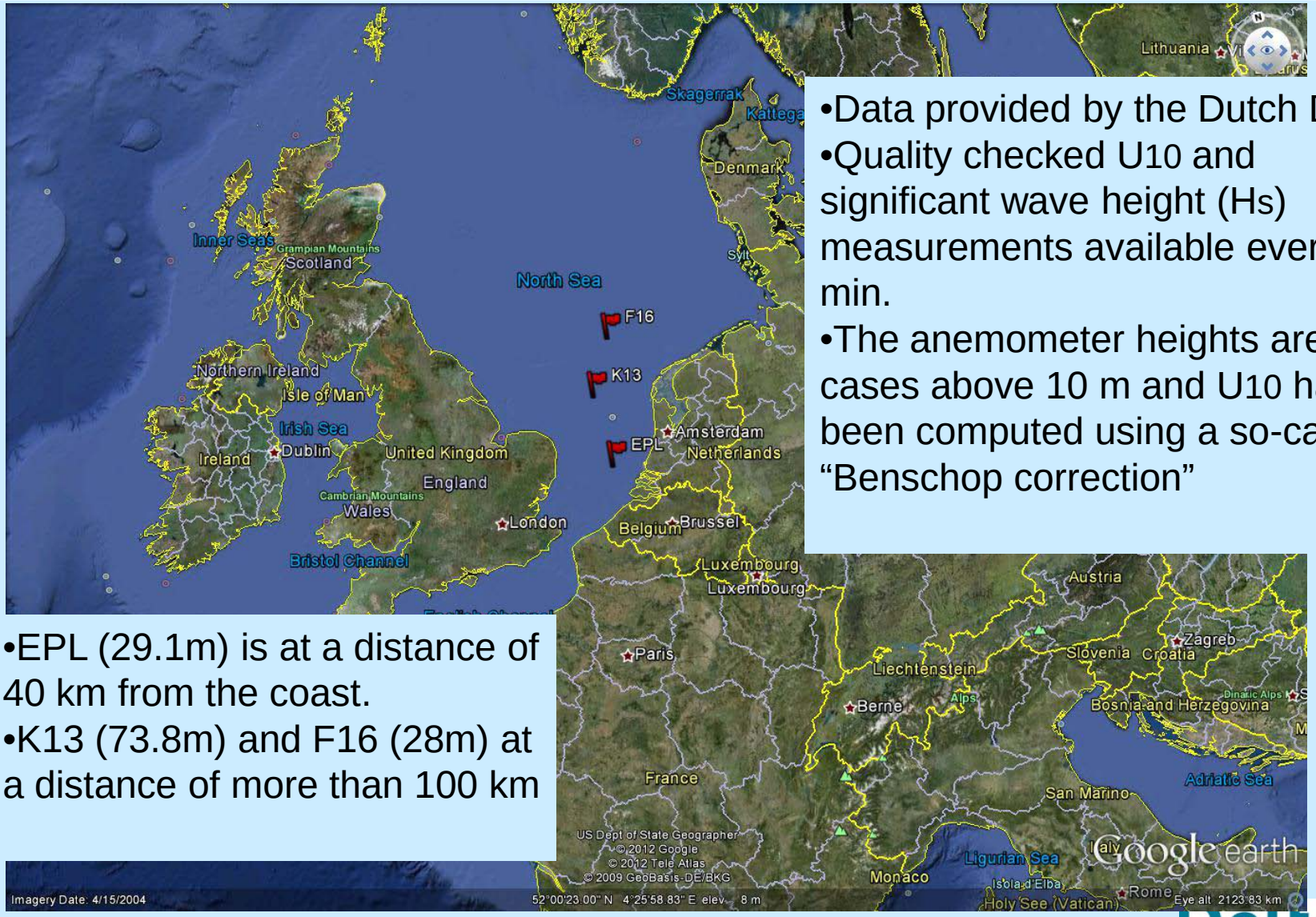
Data description: new operational SWAN model for North Sea





- Model forcing winds are KNMI HIRLAM wind fields
- Hourly (nowcasts) available from both models
- Considered data: U10 (HIRLAM) and Hs (SWAN)

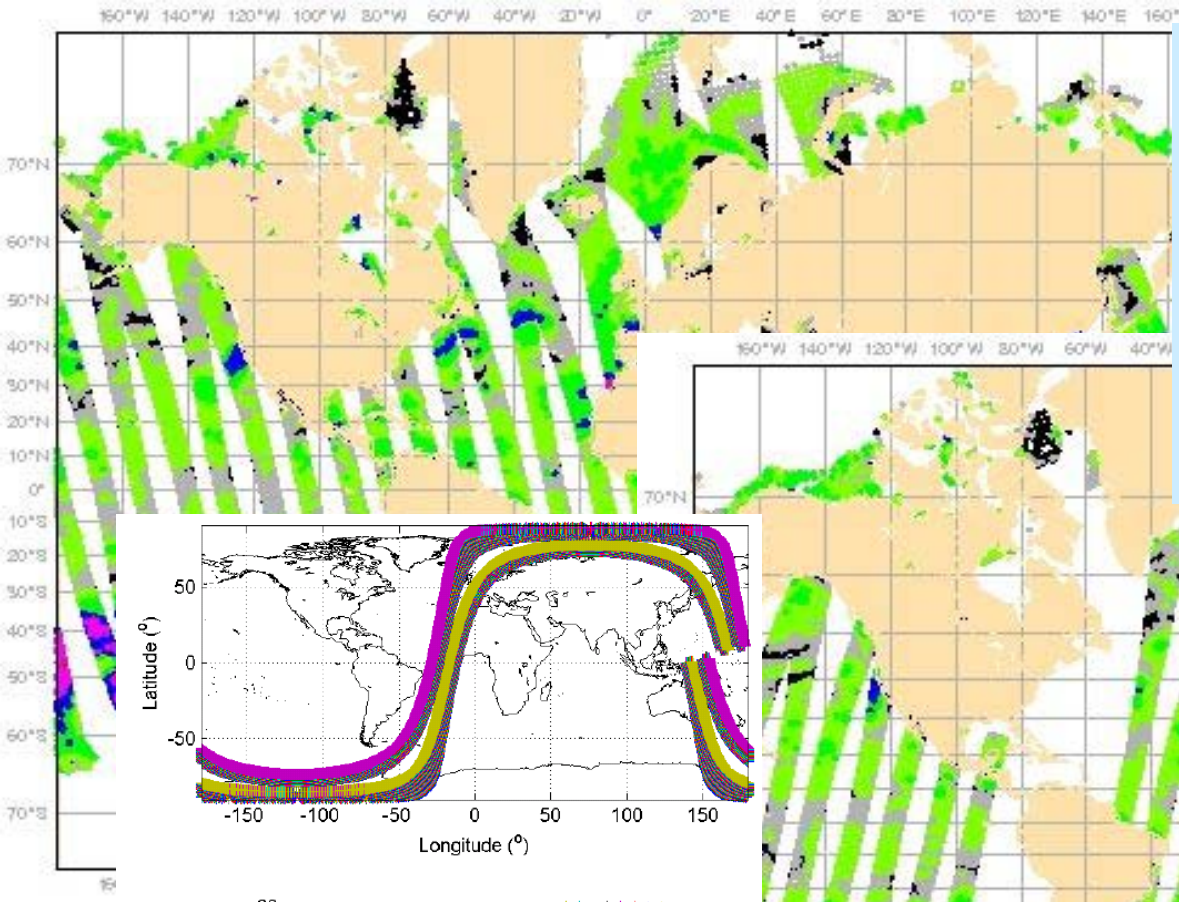
Data description: In-situ wind and wave measurements

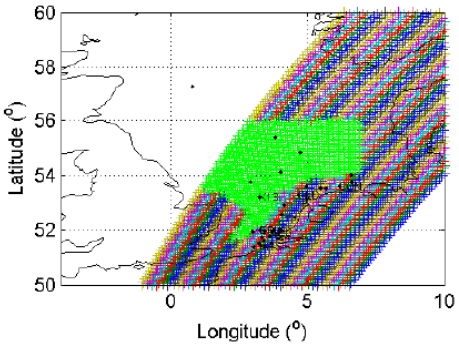


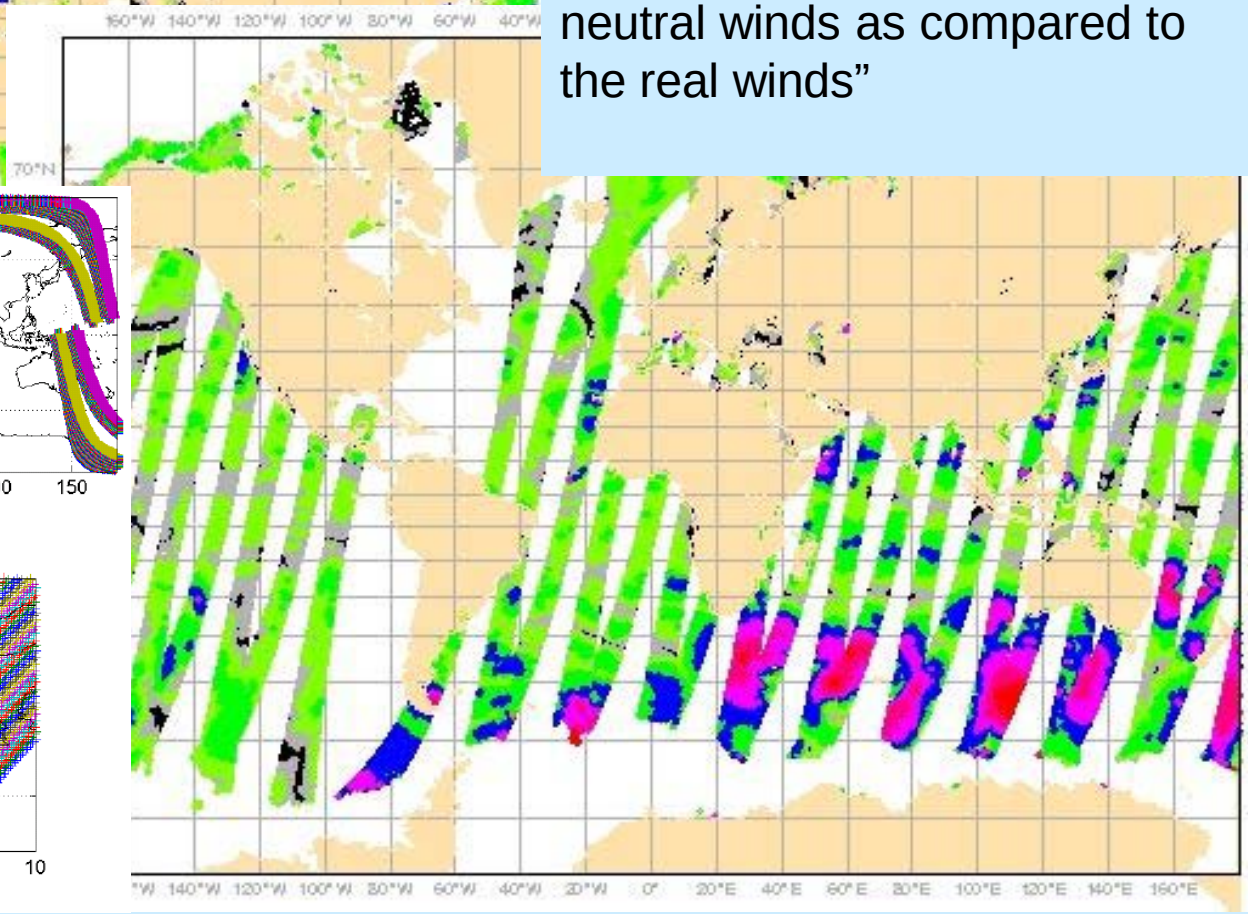
- Data provided by the Dutch DiD
- Quality checked U10 and significant wave height (Hs) measurements available every 10 min.
- The anemometer heights are in all cases above 10 m and U10 has been computed using a so-called “Benschop correction”

- EPL (29.1m) is at a distance of 40 km from the coast.
- K13 (73.8m) and F16 (28m) at a distance of more than 100 km

Data description: ASCAT

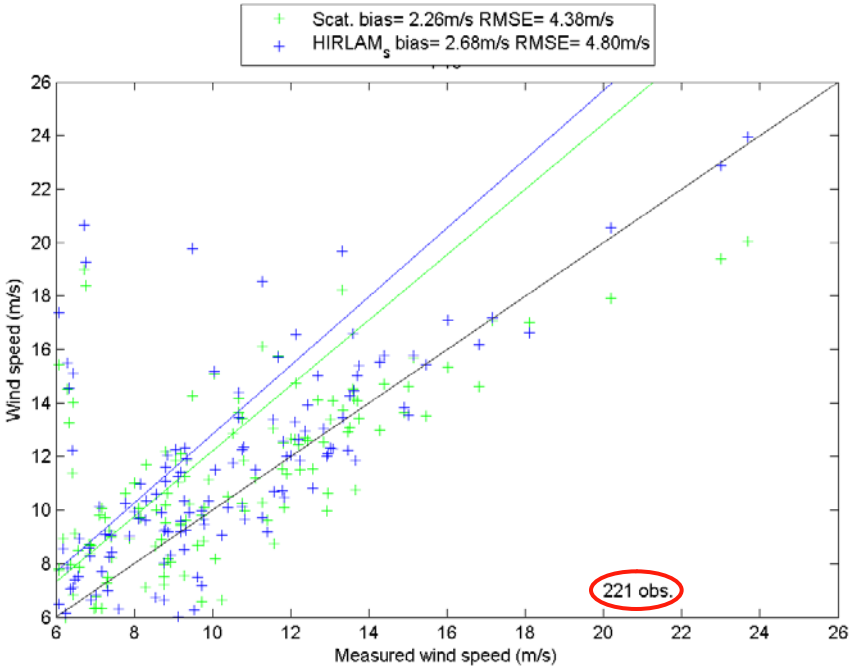


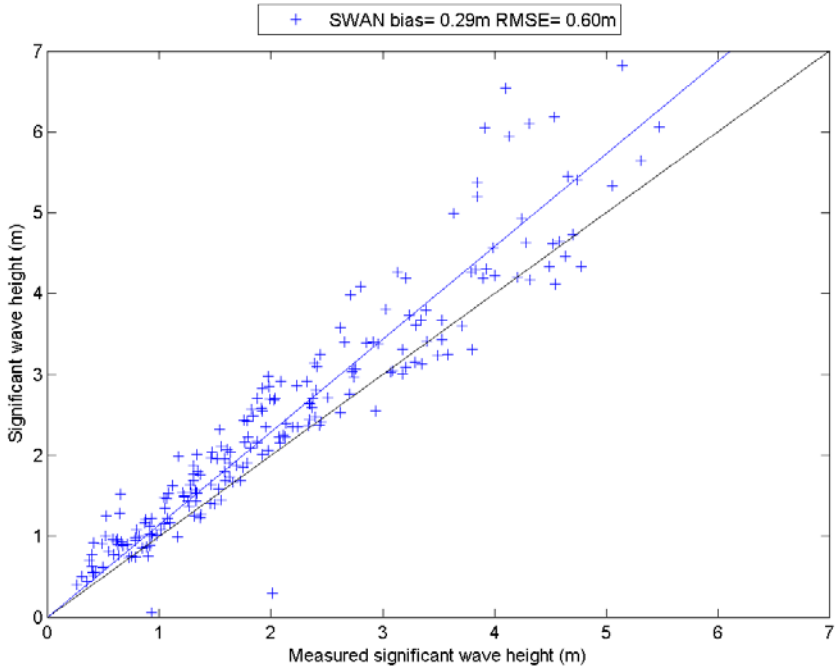




- Data provided by Gert-Jan Marseil and Ad Stoffelen, KNMI
- ASCAT 12.5-km product
- 10-m neutral winds
- “bias of +0.2 m/s for the neutral winds as compared to the real winds”

Data collocation at F16 from 10/2011 until 3/2012

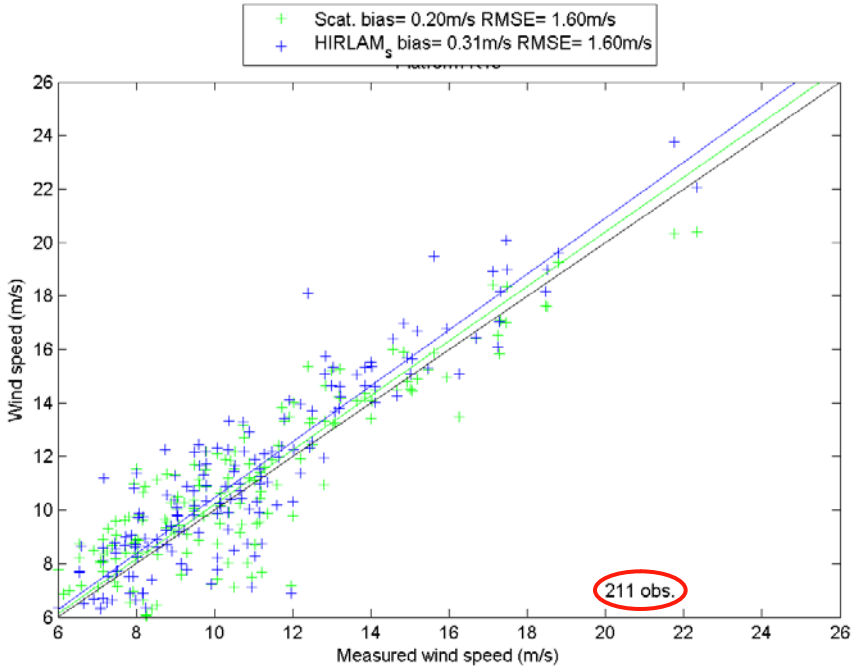


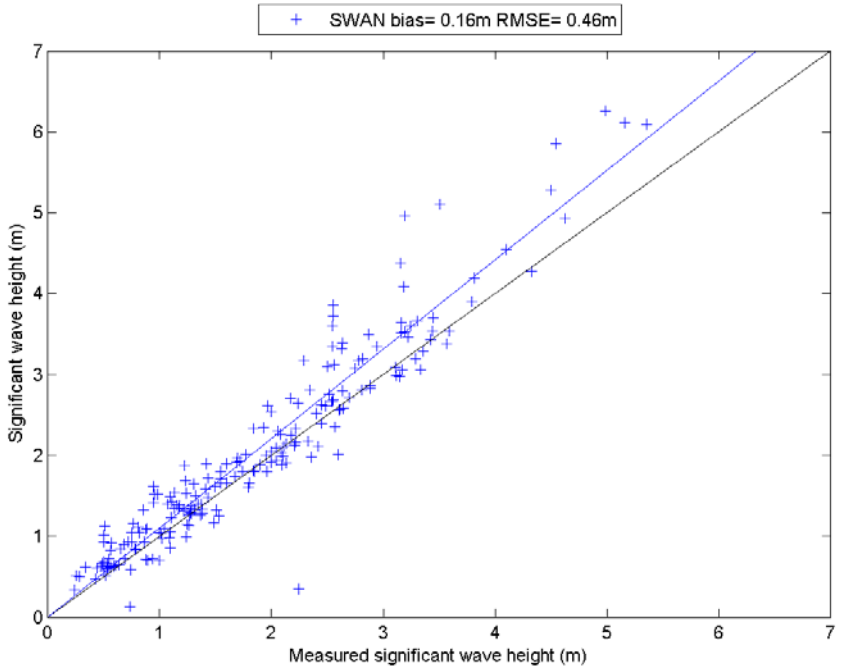


Overestimation of U10 by HIRLAM → Overestimation of Hs by SWAN

Deltares

Data collocation at K13 from 10/2011 until 3/2012

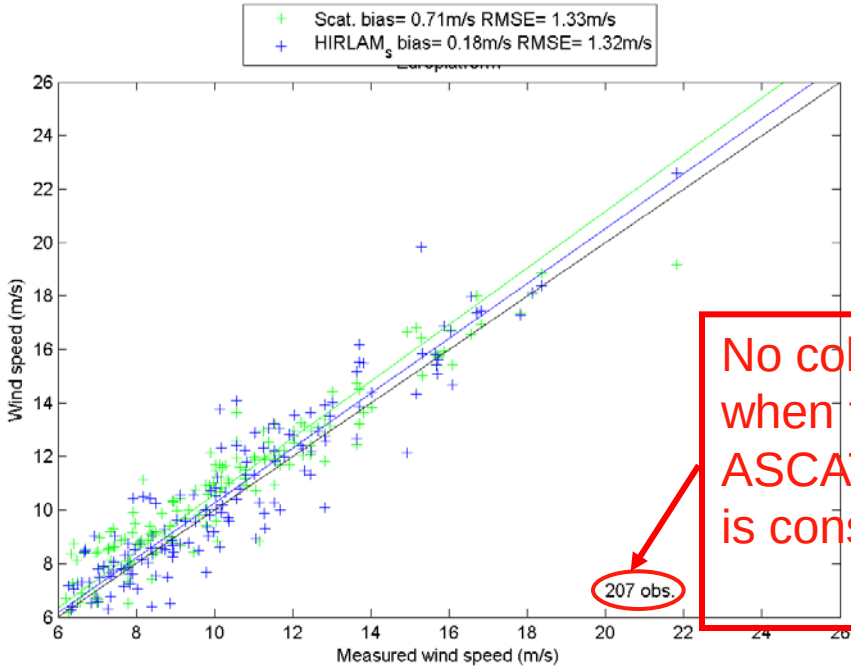




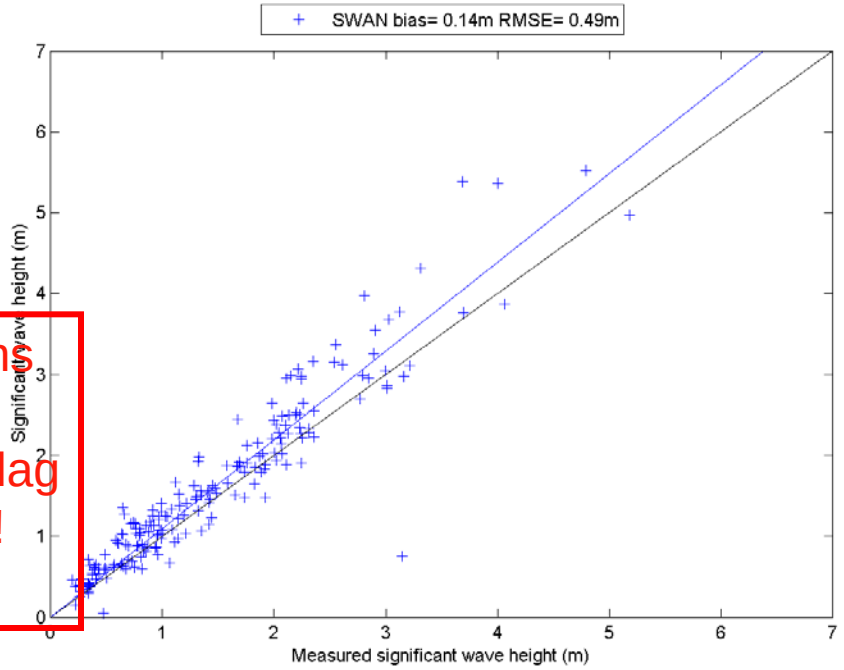
Overestimation of U10 by HIRLAM → Overestimation of Hs by SWAN

Deltares

Data collocation at Euro platform from 10/2011 until 3/2012



No collocations when the ASCAT land flag is considered!

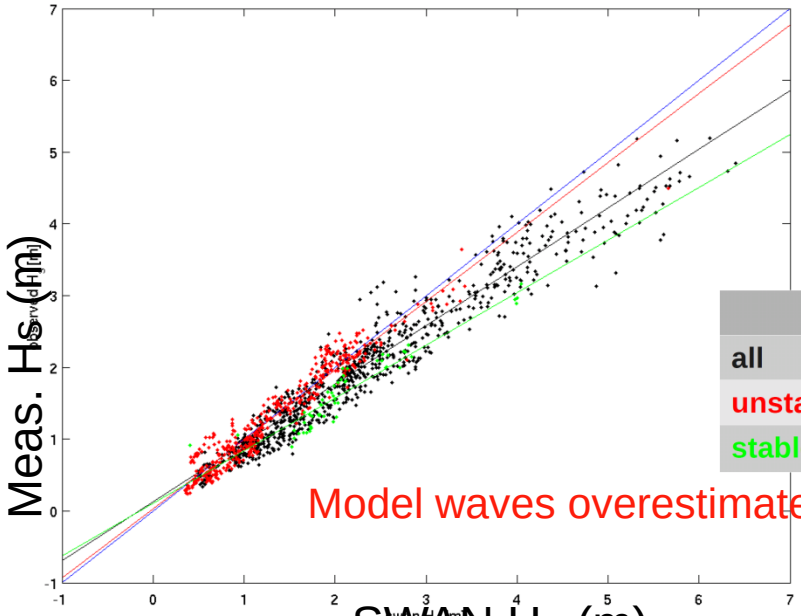


Overestimation of U10 by HIRLAM → Overestimation of Hs by SWAN

Deltares

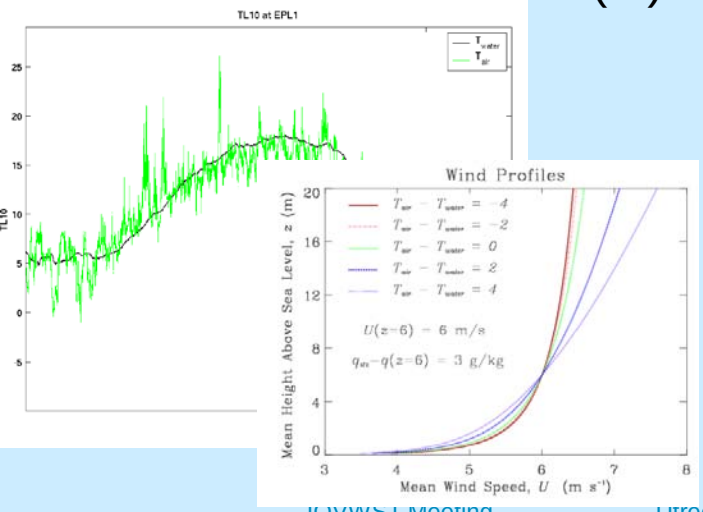
The influence of atmospheric stability in the quality of the model wind and waves

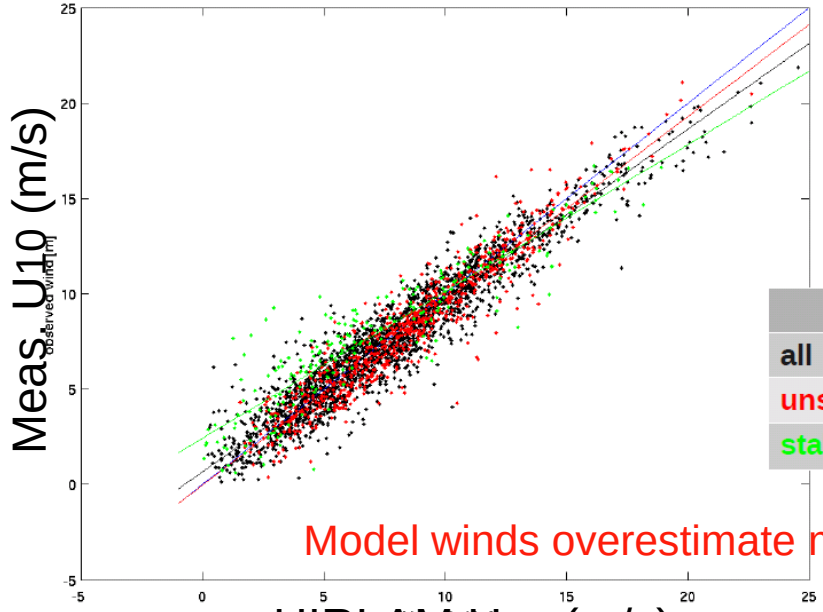
Dec 2011 –Feb 2012



	slope
all	0.82
unstable	0.96
stable	0.73

Model waves overestimate measurements





	slope
all	0.90
unstable	0.97
stable	0.77

Model winds overestimate measurements

Conclusions

- In general, there is a better correspondence between the scatterometer winds and the measurements, than between the model winds and the measurements.
- The errors in the model winds and the errors in the wave model results are correlated.

=>The use of nearshore scatterometer data in the coastal North Sea forecasting system will potentially lead to improved coastal North Sea wave forecasting.

=> The fact that the scatterometer provides neutral equivalent winds also seems to be beneficial.

Deltares

Future work

- Assimilation of wind and ascat data in the wave model
- Assimilation of ascat data in the wind model (KNMI)
- Forcing of the wave model with the model+ascat winds

Acknowledgments: Gert-Jan Marseille and Ad Stoffelen, KNMI
Data-ICT-Dienst Rijkswaterstaat
Caroline Gautier (Deltares)

Deltares