



Royal Netherlands
Meteorological Institute
*Ministry of Infrastructure and the
Environment*

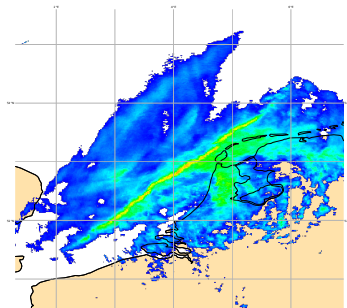
The effect of high resolution modelling on storm surge forecasts

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KNMI, NL

Motivation

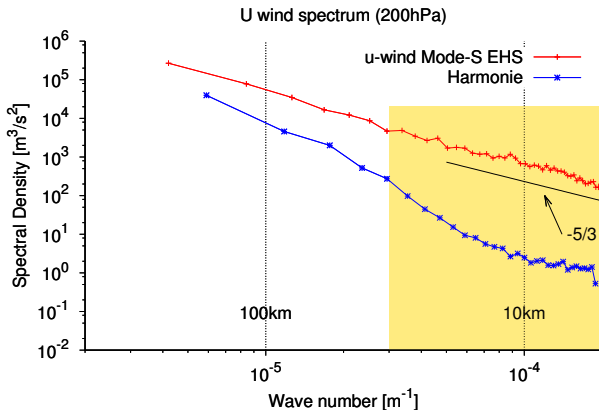
- Increasing resolution of NWP and storm surge models
- Is it any better?
- Are there other benefits?
- New sensitivities?
- Cases for the NL coast



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Resolution vs grid size





Input parameters for storm surge

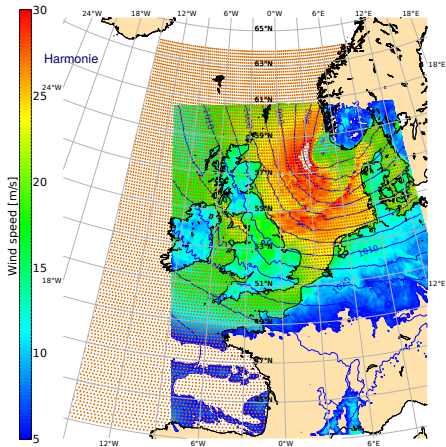
Classic

- Pressure p_{msl}
- Wind \vec{u}_{10}
- Time interval 1 h

Proposed

- Pressure p_{msl}
- Momentum transfer (surface stress) $\vec{\tau}$
- Time interval 20 min

Models for storm surge forecasting



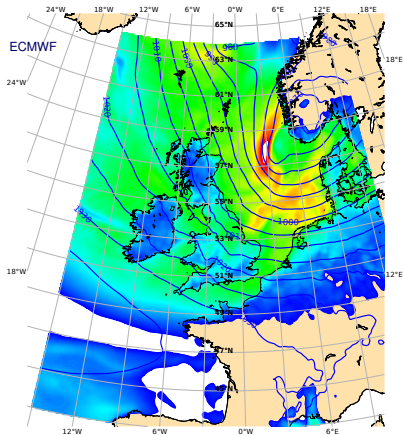
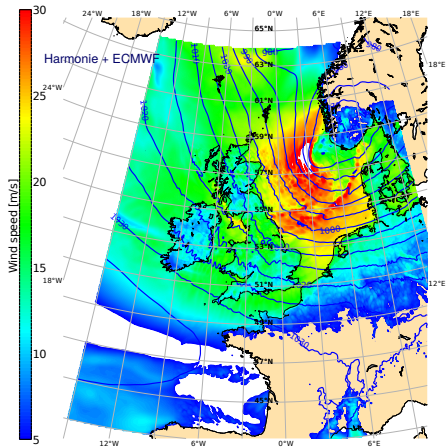
NWP

- Harmonie (2.5 km)
- ECMWF (~9 km)

Storm surge

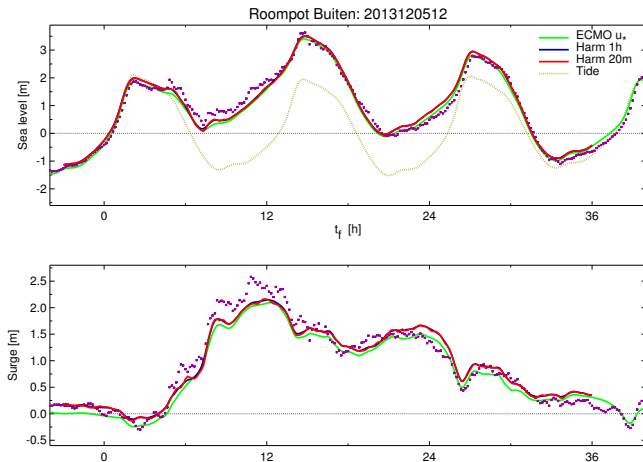
- DCSMv6 (~1.6 km)

Domain extension

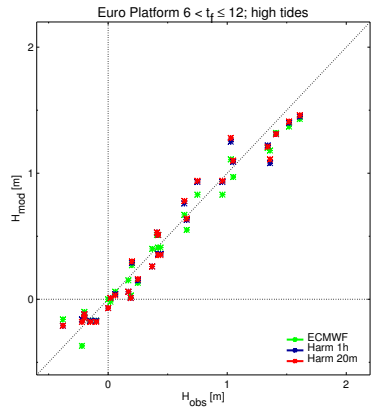
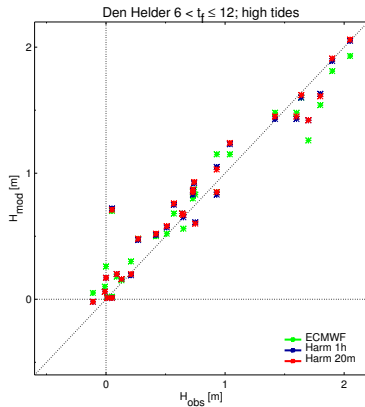




Large-scale storm surge

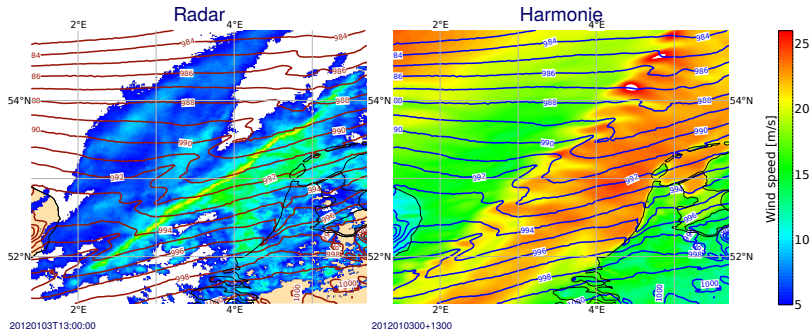


Large-scale storm surge



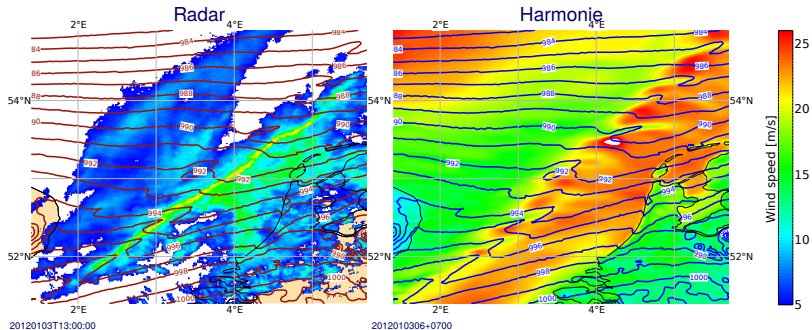


Small-scale: Jan 2012 *meteo tsunami*

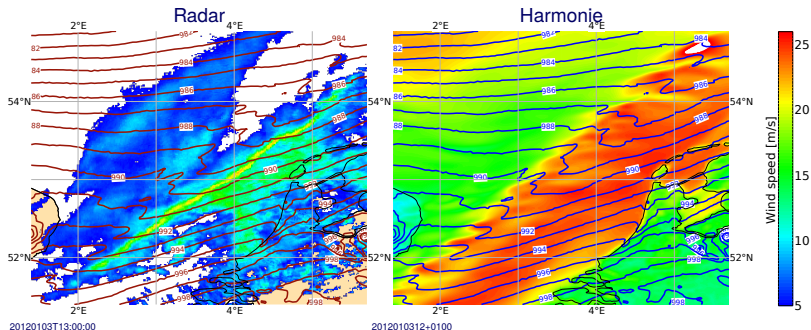




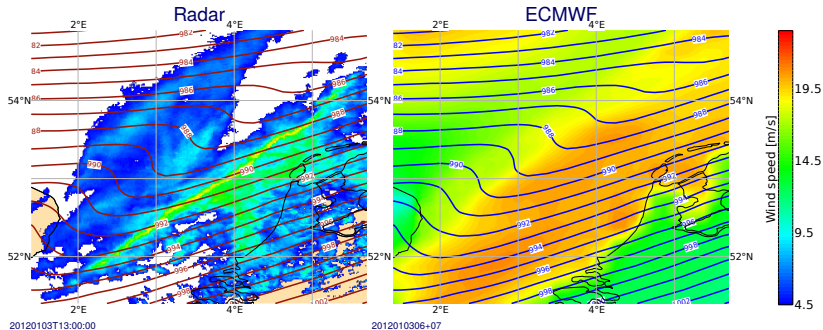
Small-scale: Jan 2012 *meteo tsunami*



Small-scale: Jan 2012 *meteo tsunami*

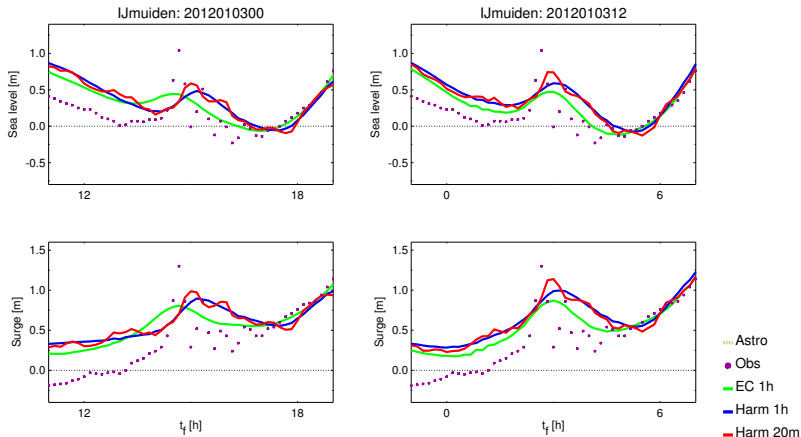


Small-scale: Jan 2012 *meteo tsunami*



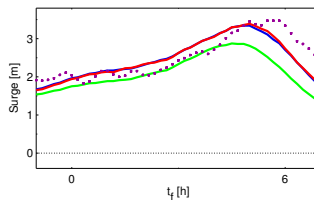
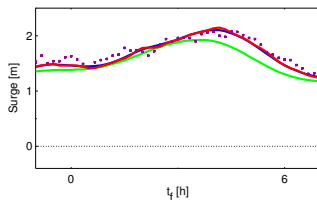
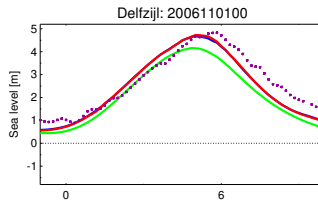
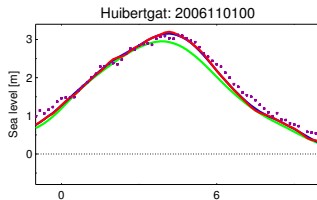


Small-scale: Jan 2012 *meteo tsunami*



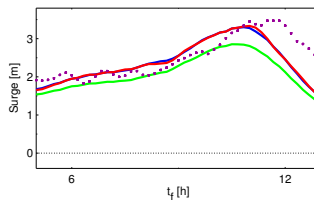
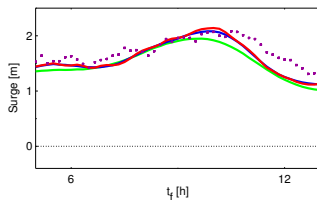
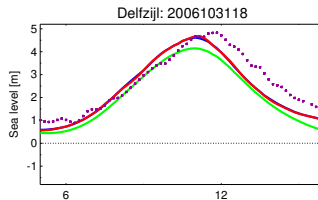
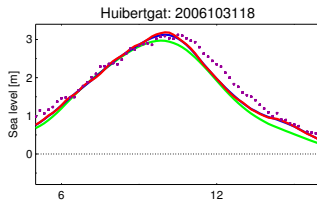


Small-scale: Nov 2006 *all saints*



- Astro
- Obs
- EC 1h
- Harm 1h
- Harm 20m

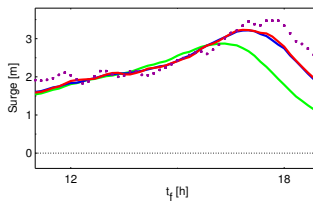
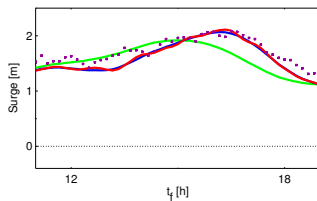
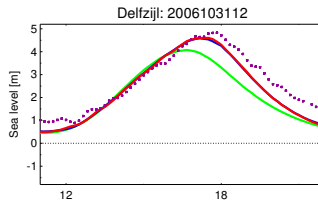
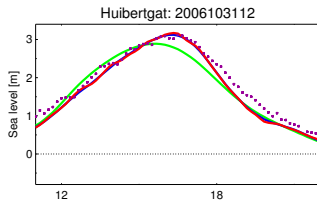
Small-scale: Nov 2006 *all saints*



- Astro
- Obs
- EC 1h
- Harm 1h
- Harm 20m



Small-scale: Nov 2006 *all saints*



- Astro
- Obs
- EC 1h
- Harm 1h
- Harm 20m



Conclusions

- Harmonie sometimes better than ECMWF
- Hourly input sufficient for large scale storm surges
- Small scale meteorological effects benefit from 20 min input
- Squall lines still not resolved
- Ensembles to identify uncertainty



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Thank you