Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu

HARMONIE at KNMI and future work

HIRLAM-ALADIN meeting
15-18 April 2013
Reyjavik, Iceland

Jan Barkmeijer
KNMI

OUTLINE

- Harmonie suites at KNMI
- Experiences with new observation sets
- Projects with Harmonie
- Final remarks and outlook

Three 3dvar Harmonie suites at KNMI

- CY36h1.4 and Hirlam LBC
- CY36h1.4 + Mode-S and Hirlam LBC
- CY37h1.2 + Mode-S
  and hourly ECMWF LBC

Suite characteristics

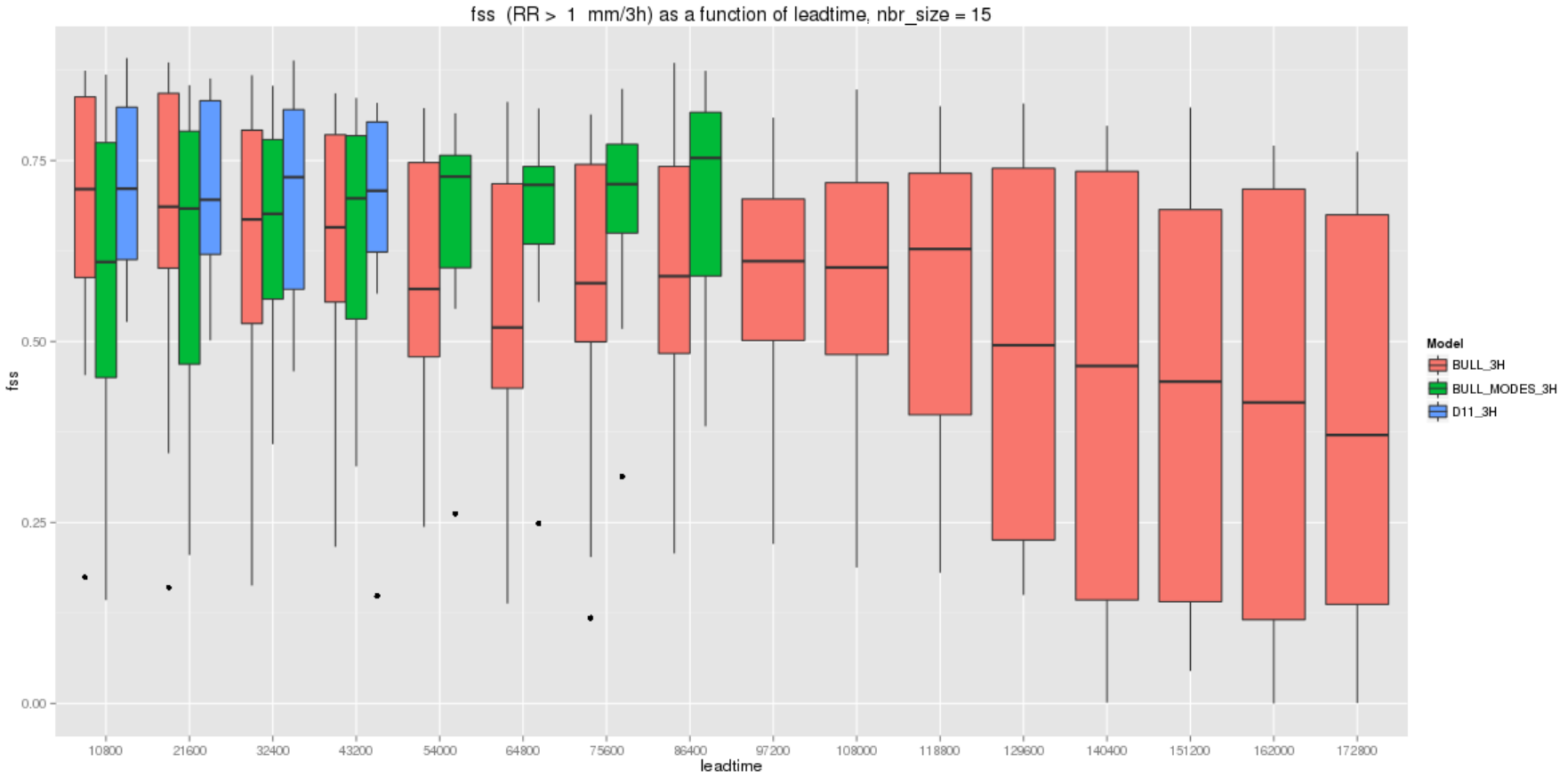
- 800x800x Meteo-France 60 level definition
- 8x/day 3dvar analyses at 0,3,6,9,12,15,18, and 21 UTC (-1,5h/+1h)
- 8x/day T+48h forecast
- hourly post-processing (300x300 at 2,5km and 800x800 at 5km)
- monitoring:

  > DMI site:
  https://hirlam.org/portal/oprint/WebgraF/ObsVer/HAAA/index.html?choice_ind=Surface

  > KNMI tools: observation usage, selected 2D-plots, time series.

[talk by Sander Tijm]

Fraction Skill Score



3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48

[see poster Emiel van der Plas]

Data sets planned for 2013/2014 in Harmonie are:

- GPS
- MSG (cloud mask)
- ATOVS
- Mode-S/MUAC >talk by Siebren de Haan

❖ RADAR (Netherlands and Belgium)

❖ ASCAT

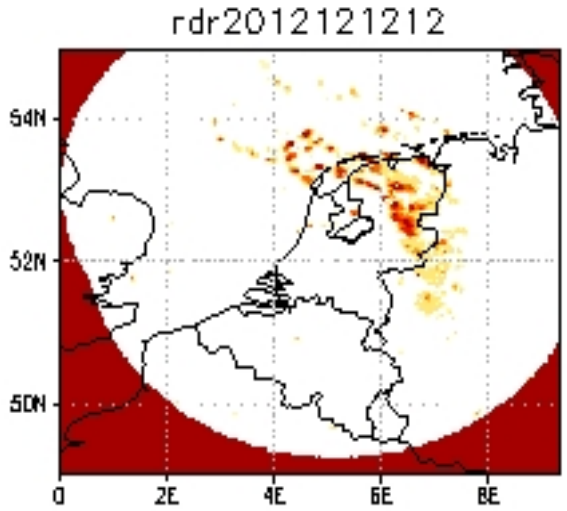
RADAR data in Harmonie

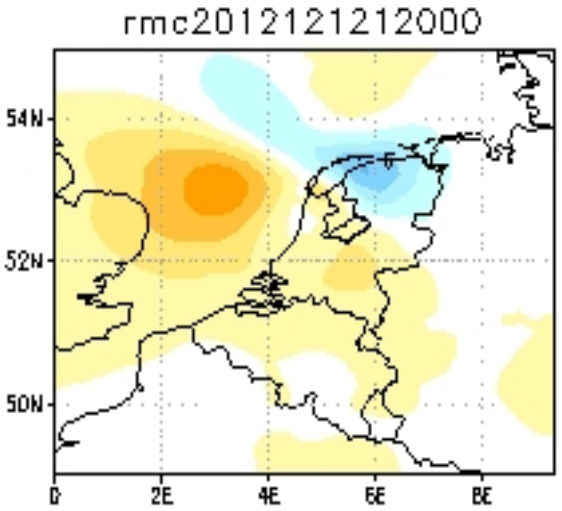
- two C-band Doppler weather radars (De Bilt/Den Helder)
- data in HDF5 format
- quality control (BALTRAD) will be applied soon
- radar-data impact (radial wind only) has been studied for two periods of ten days in 2012

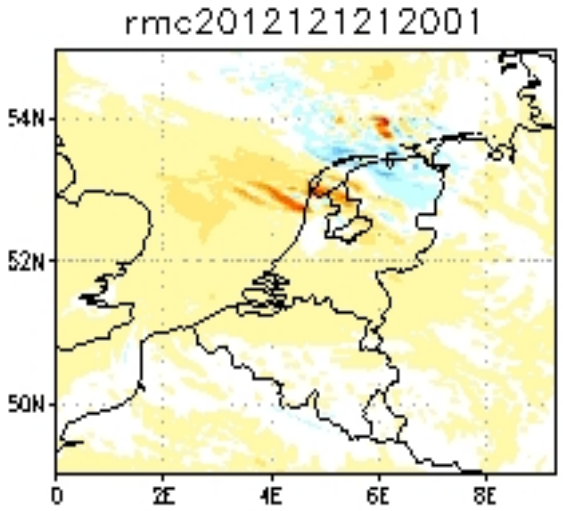
Impact of radar data (radial wind only)

an(radar) - an(no radar)
temperature

1 hour later



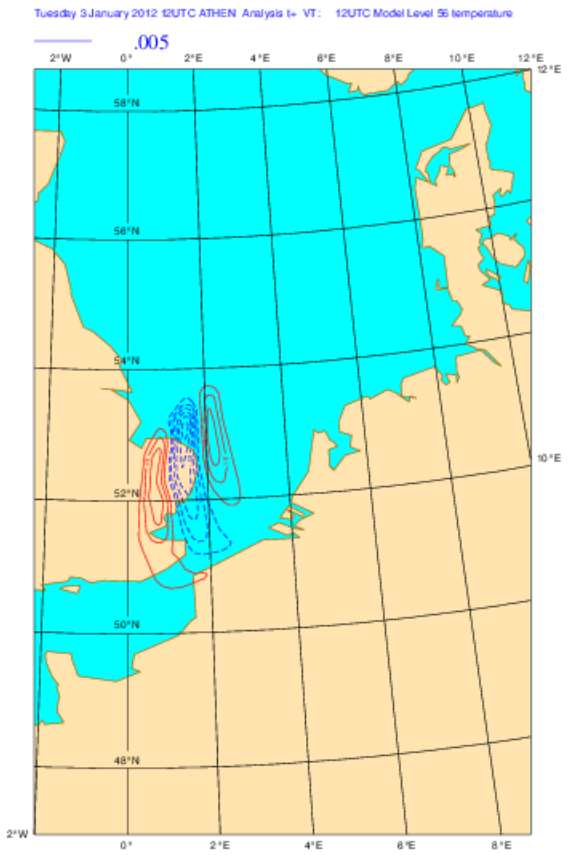




courtesy of Wim Verkley

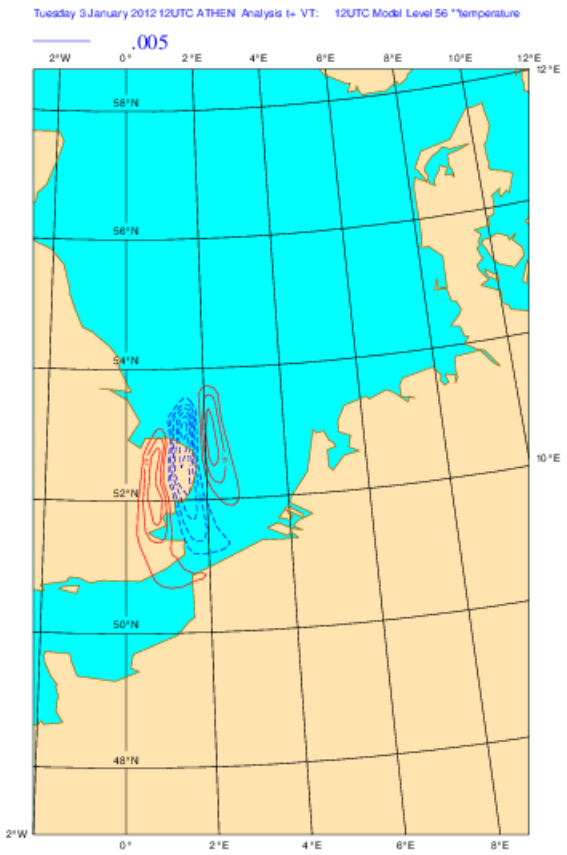
LINEAR

SV

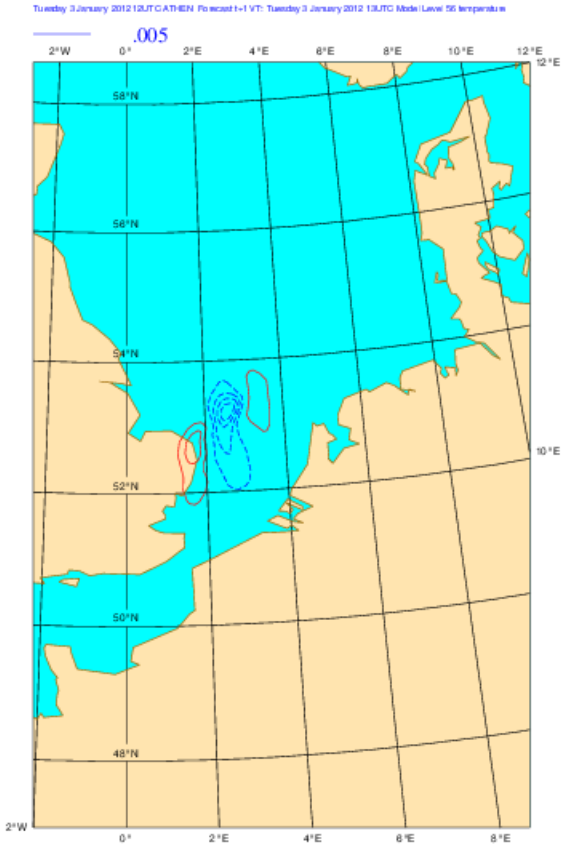


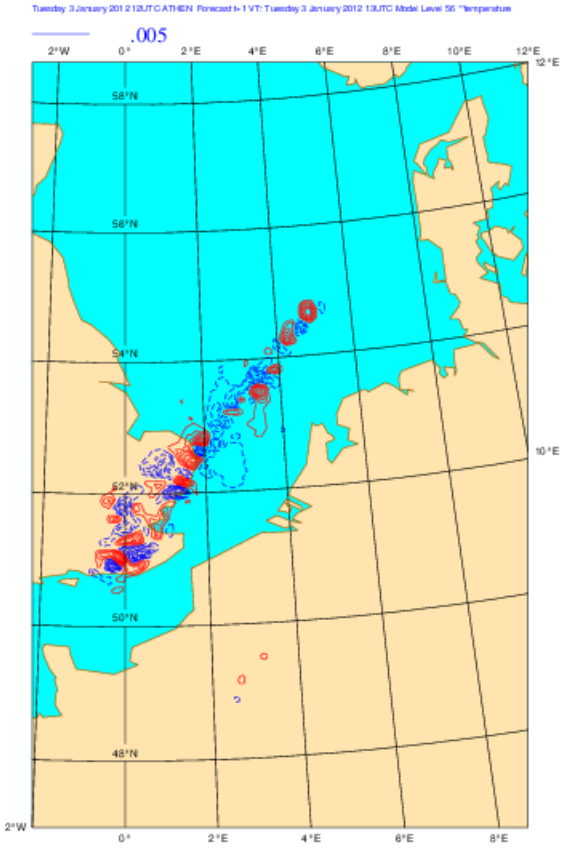
NONLINEAR

(IC + SV) - IC



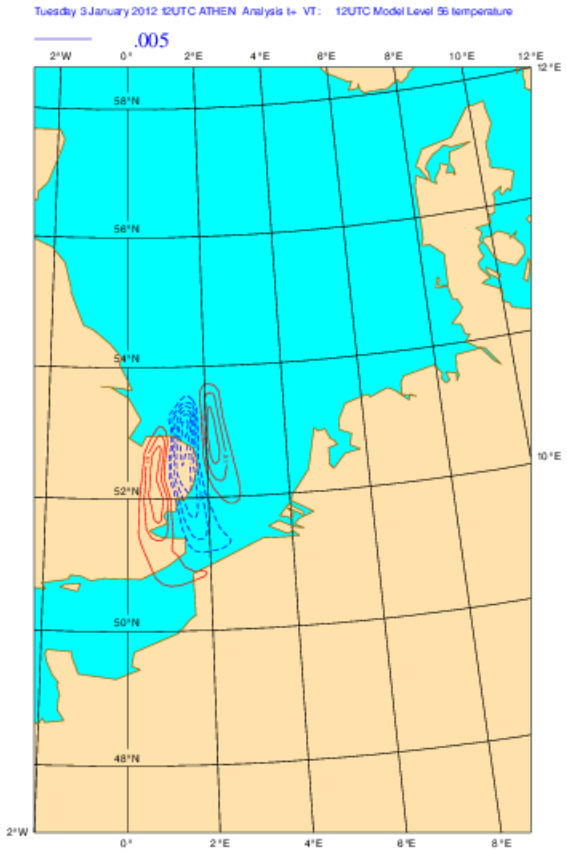
and after 1 hour





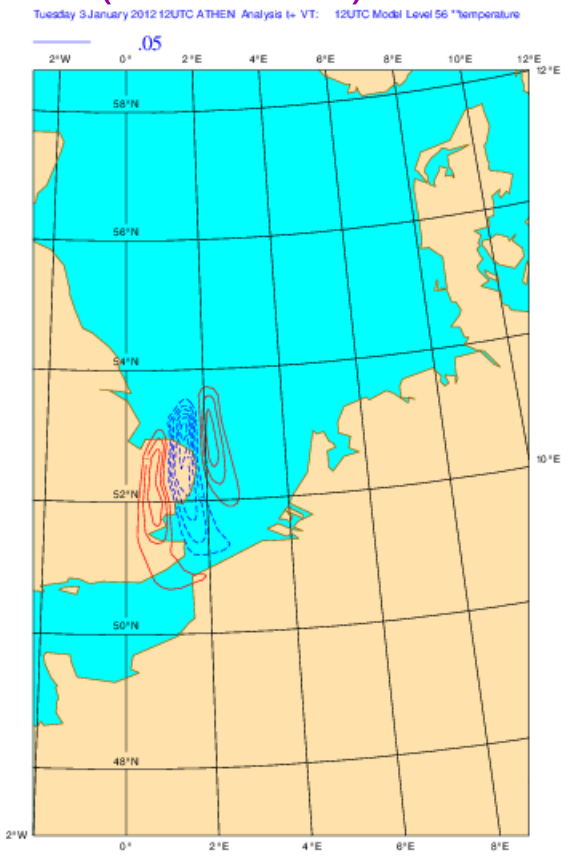
LINEAR

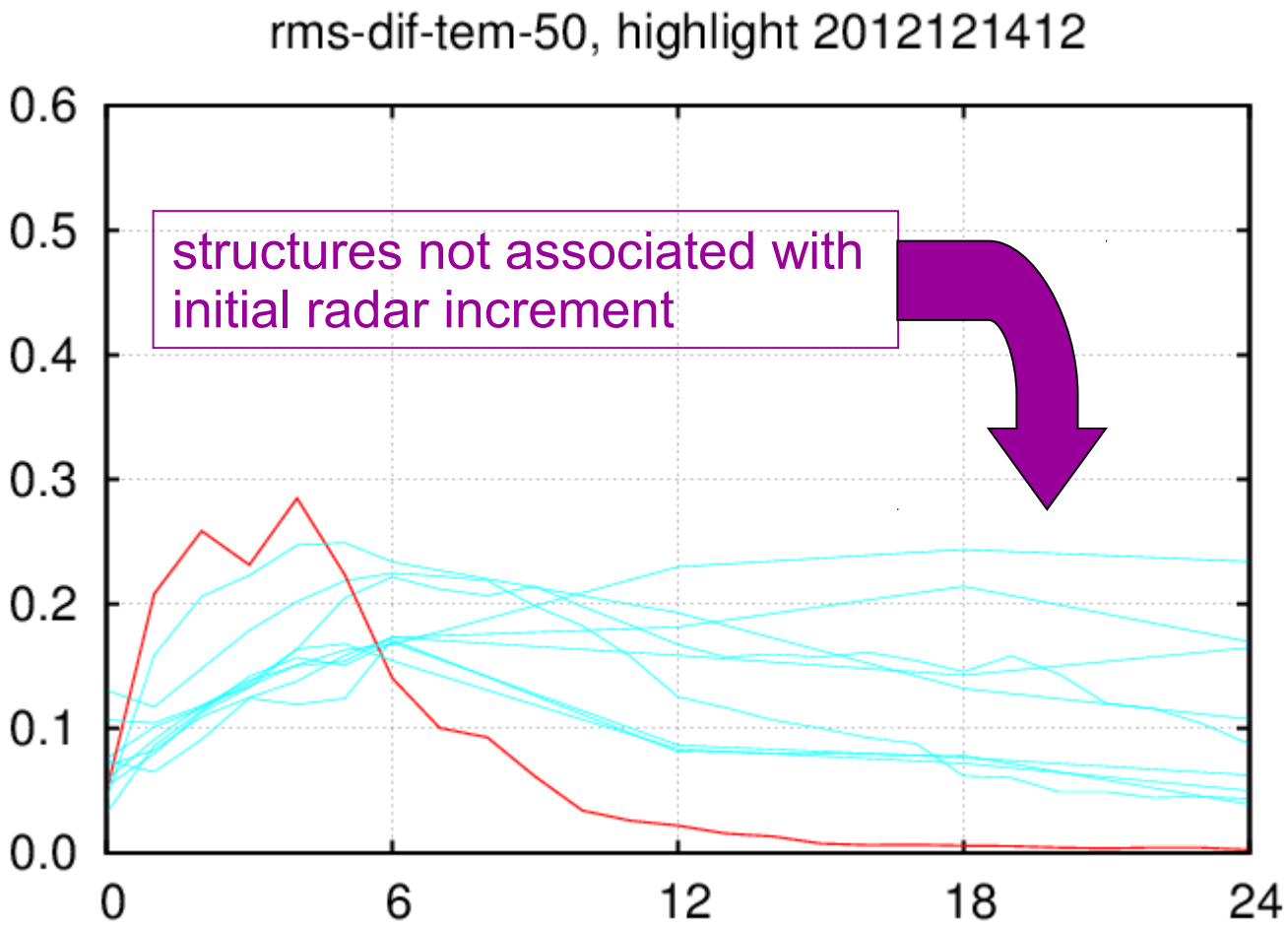
SV



NONLINEAR

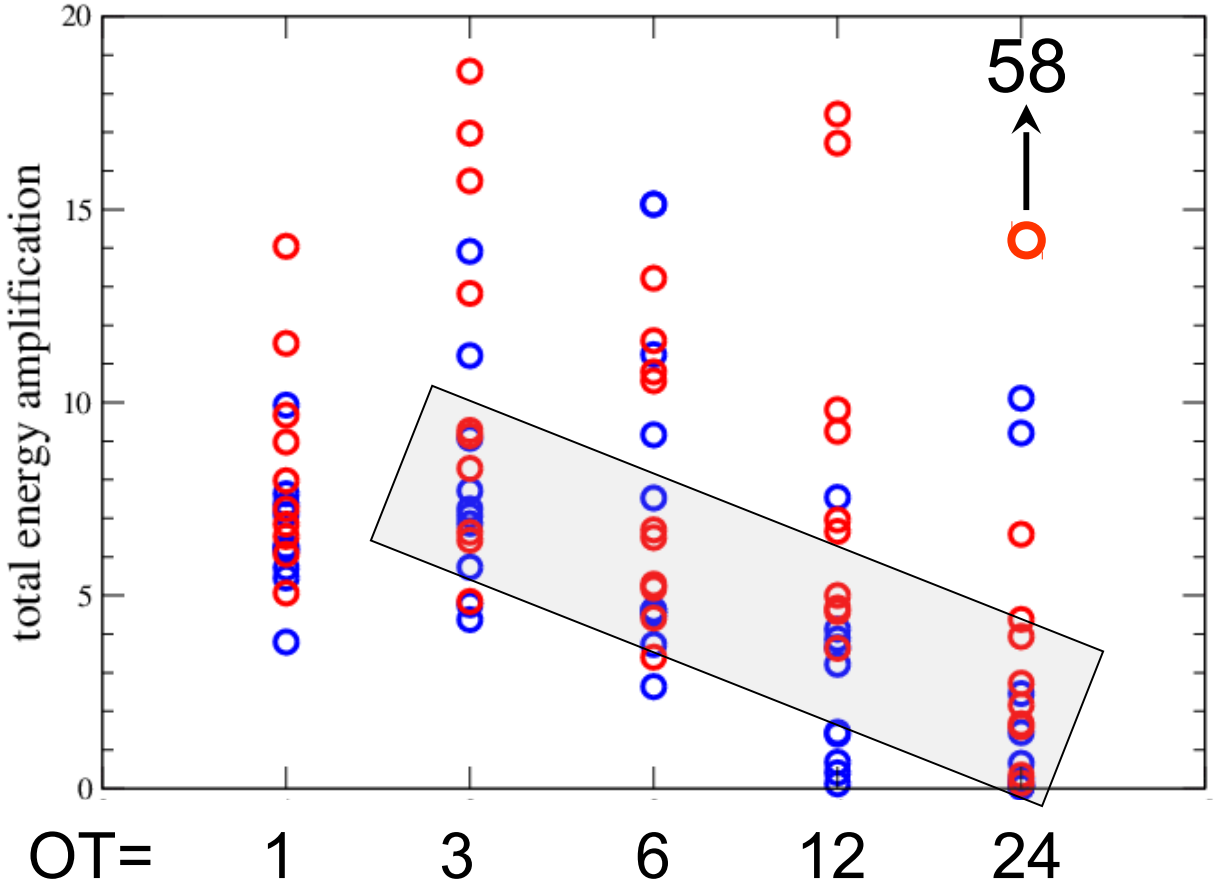
(IC+**10***SV) - IC




rms-dif-tem-50, highlight 2012121412
structures not associated with initial radar increment
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
6
12
18
24

Singular vector growth in terms of total energy

proxy for maximal perturbation growth



winter

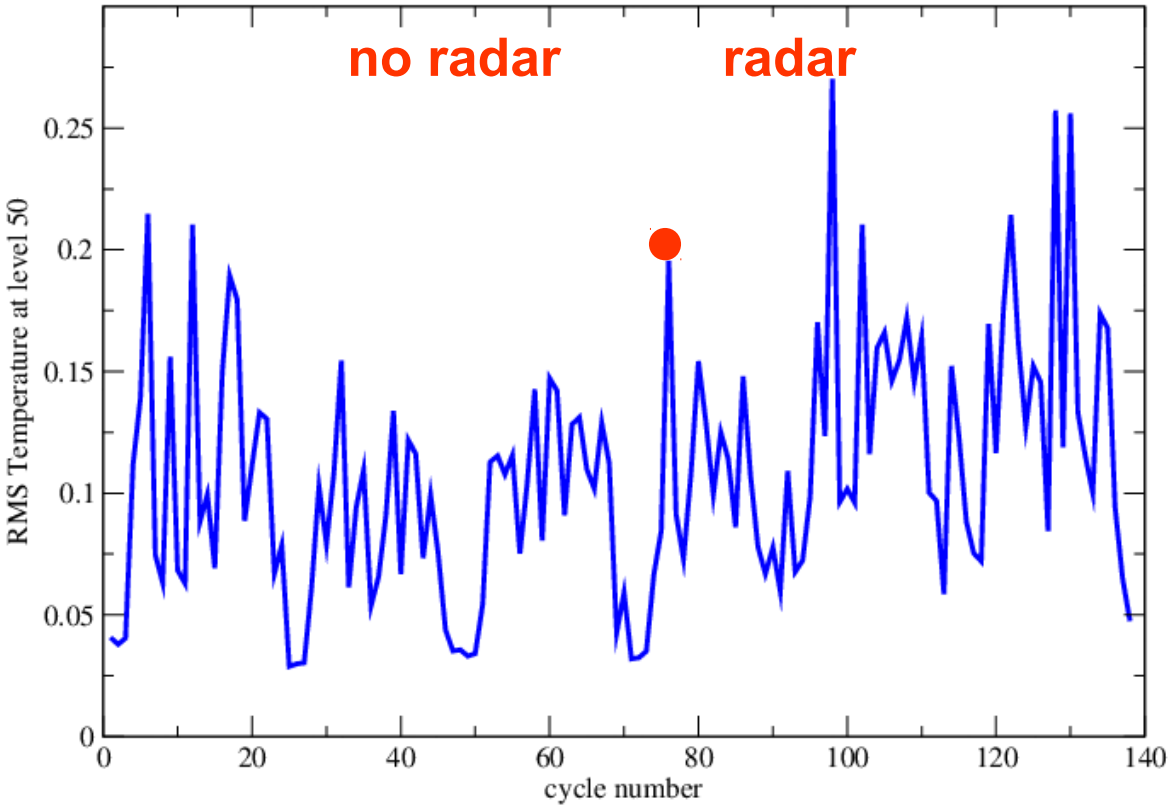
summer

2x10 cases 2012

domain is
1000 sq km

Radar data in an experimental Harmonie RUC

RMS analysis increment (temperature level 50)



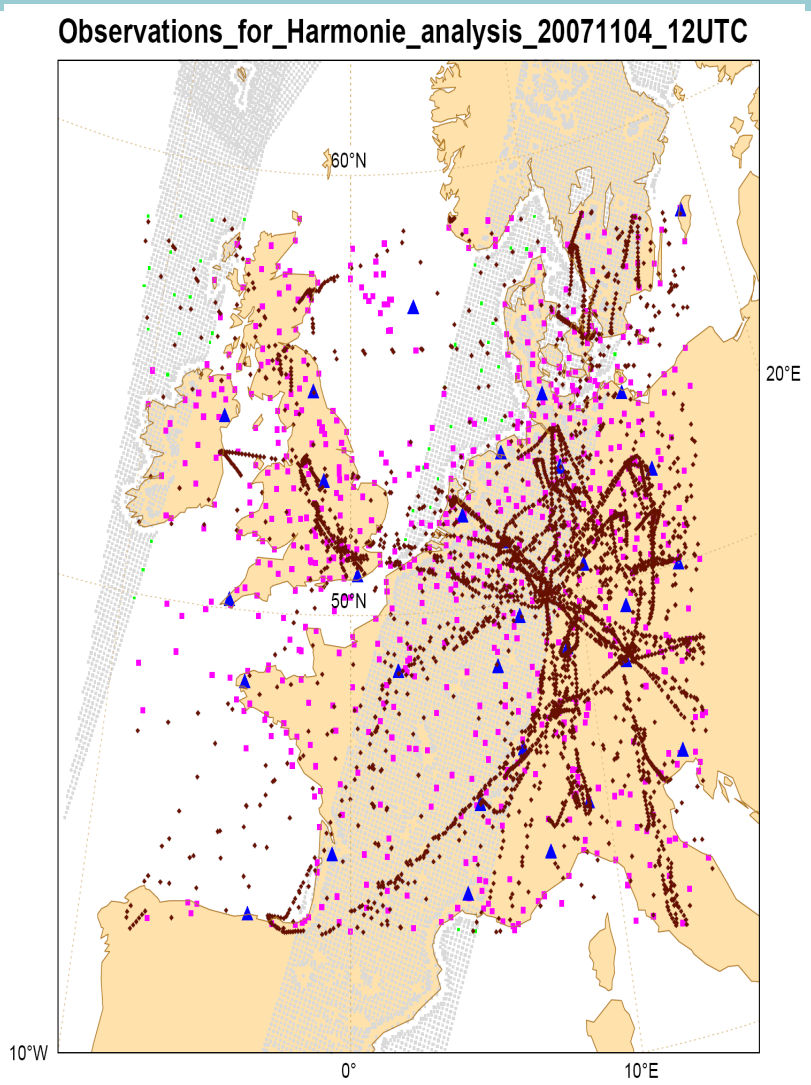
- cycling time is 1 hour
- domain 300x300 gp
- conventional data + Mode-S (NL)+ radar

Scatterometer

Harmonie Scatterometer assimilation work is funded by the EU MyWave project (http://mywave.eu)

- Scatterometer and Harmonie model ocean surface fields are used as input to force wave models
- Harmonie configuration 37h1.2 at 800x800 grid
- Assimilation of KNMI level-2 OSI-SAF ASCAT and QuikSCAT products works technically for QuickSCAT 25-km and ASCAT coastal (12.5-km) products

courtesy of Gert-Jan Marseille



Analysis 4 Nov. 2007 12UTC

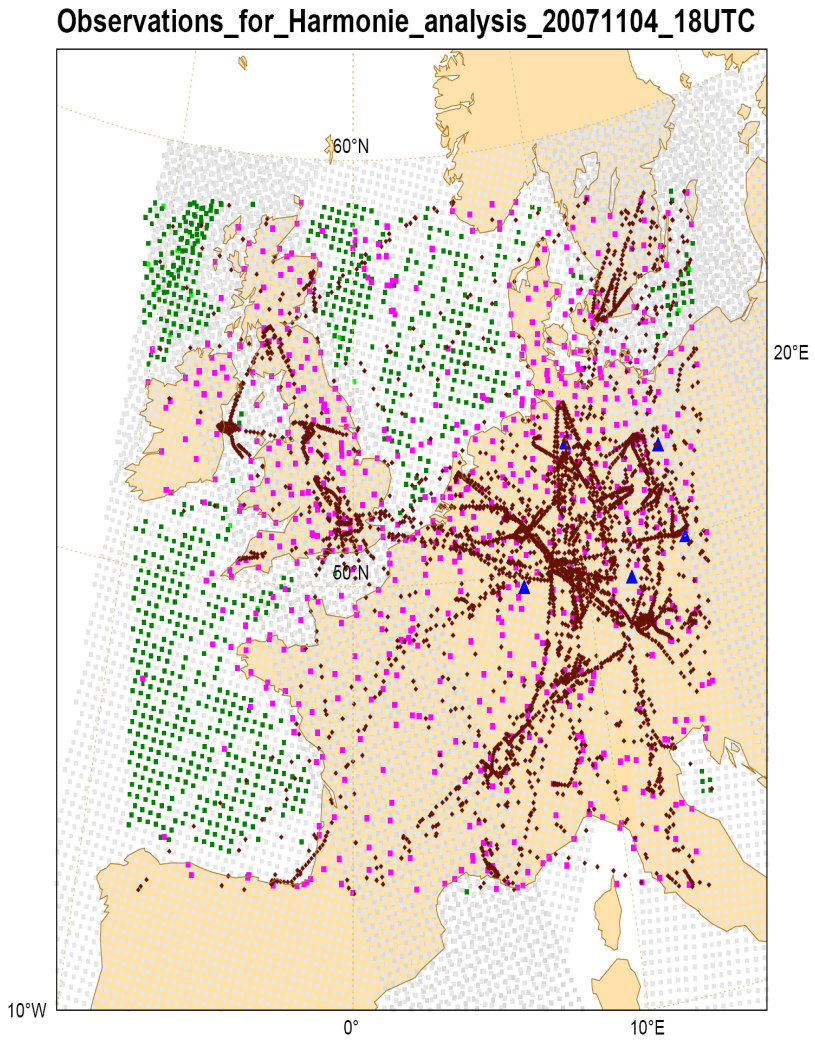
Assimilation of

TEMP, AIREP, SYNOP, ASCAT, QuikSCAT (all scat locations)

ASCAT coastal (12.5 km) product

Default setting is thinning to 4 times the observation spacing

No QuikSCAT data in domain



Analysis 4 Nov. 2007 18UTC

Assimilation of

TEMP, AIREP, SYNOP, ASCAT, QuikSCAT (all scat locations)

ASCAT 25-km product

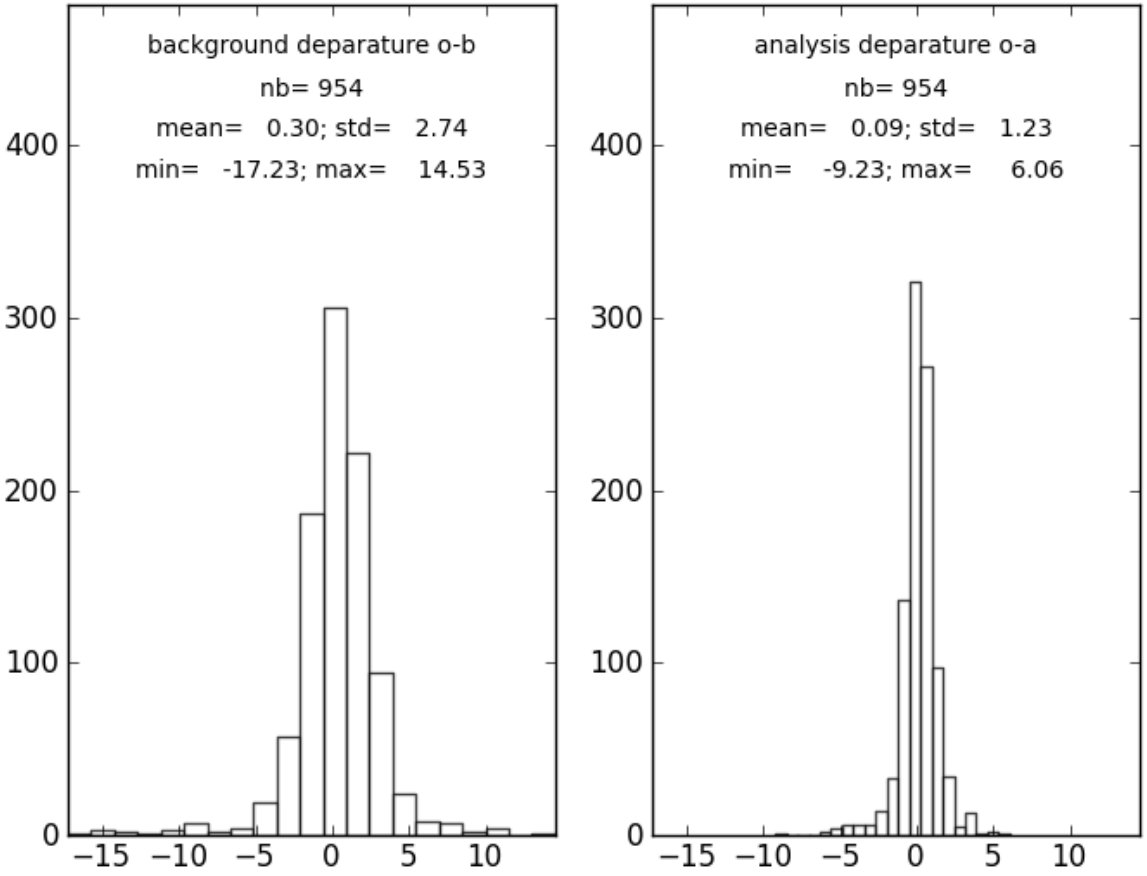
Default thinning setting is 4 times the observation spacing

QuikSCAT 25-km product

No default thinning implemented (for original 50-km product)

HA_D800_MW2_DA_conv_scat_def; 2007110400-2007111118

ascat-u



Impact experiments

Test additional value of scatterometer ocean surface winds on AN/FC

Test the impact of observation thinning; experiments with/without thinning

Test the observation weight; specified SCAT error is larger than the true error

Implement OSCAT assimilation

Initially applied to cases identified in the MyWave project (focus on storm surge)

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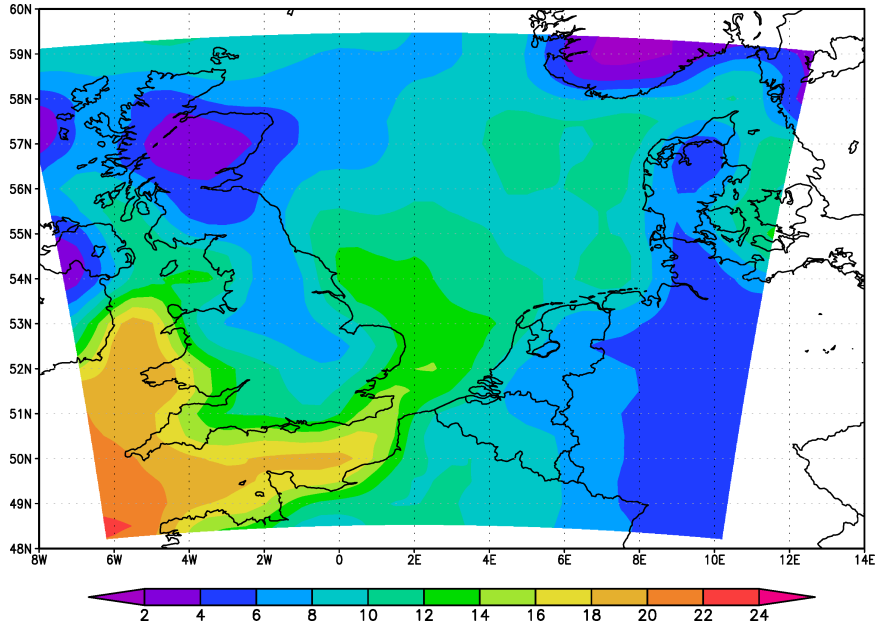
Harmonie + extreme wind climatology (SBW project)

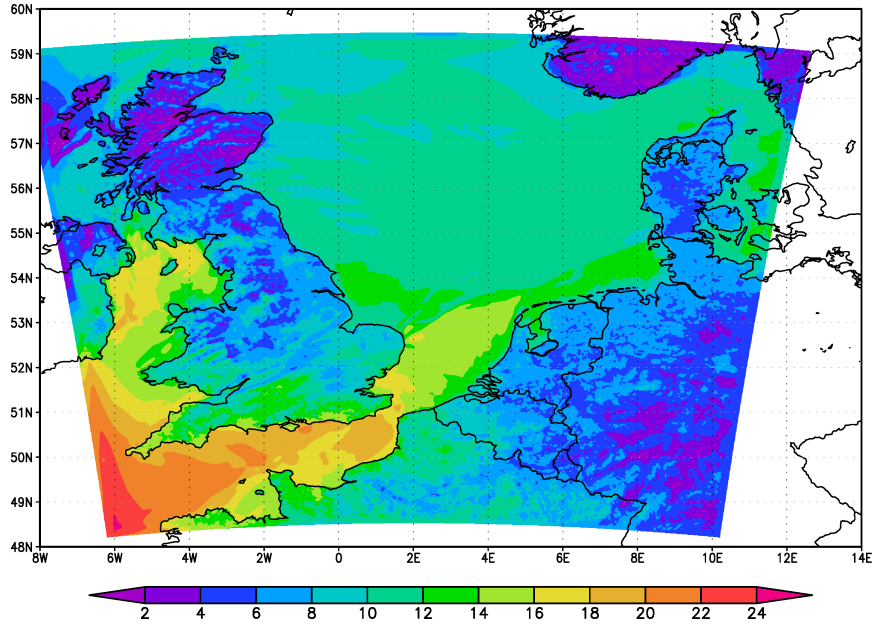
- An extreme wind climatology for setting the requirements on Dutch water defences
- Dynamical downscaling of ERA-interim (80km); every 6h a new Harmonie forecast starts and fields from T+1h are used
- A set of 14 major storms in the period 1980-2011 with varying characteristics has been selected as a test sample

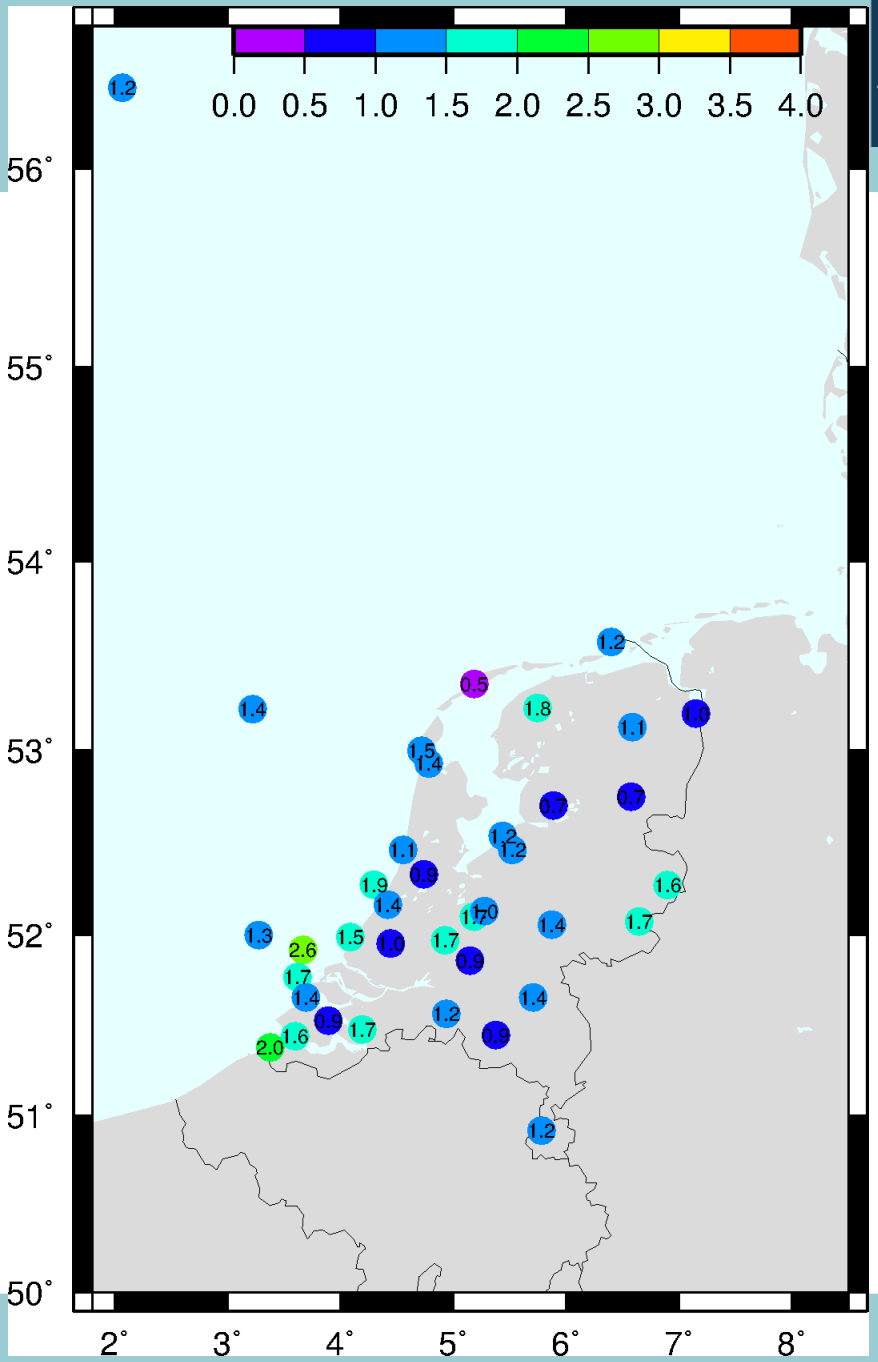
courtesy of P. Baas & H. van den Brink

ERA-interim



Harmonie (T+1 forecast)

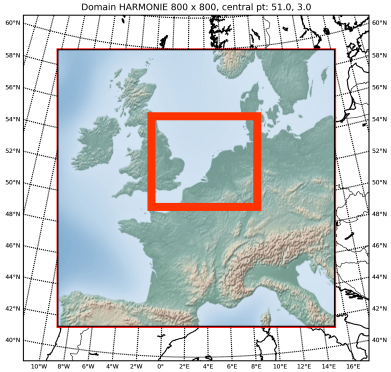




- Modelled maximum wind speeds are within 10% of observed values
- Also the case for wind direction
- All major storms (>Bf 10) will be simulated during the period 1979-2012
- Coupling with storm surge model
- Basis for extreme value analysis for returns levels 10^3–10^4 y

Harmonie Reforecasting Experiment

- During 3Q/4Q 2013 a re-run of a 37h1.2 suite will be performed for the years 2010-2012
- Conventional observation set + Mode-S (Netherlands only) and hourly ECMWF boundaries
- 3-hourly cycling and 48-hour forecasts at 0, 6, 12, 18 UTC
- a comprehensive output data set will be produced for a 750 sq km domain for statistical postprocessing.



Concluding remarks and outlook

- Operational Harmonie 37h1.2 suite will be complemented with reforecasting products in 2013/2014

- Follow-up e-suites will be based on CY38 and will involve

  - use of new data sets: RADAR, GPS, Mode-S, ASCAT, MSG
  - improved physics: EDMFM (validation/comparison with EDKF)
    "Fog over sea" [talk by Lisa Bengtsson]
    ….

- Continued research wrt Harmonie 'climate' runs, e.g. to study strong precipitation events

- Intensification of research on DA-EPS link
  (Harmonie RUC – 4DVAR, Predictability issues)