



Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu

The observations **IMPACT** experiment

HIRLAM-ALADIN meeting
4-7 April 2016
Lisbon, Portugal

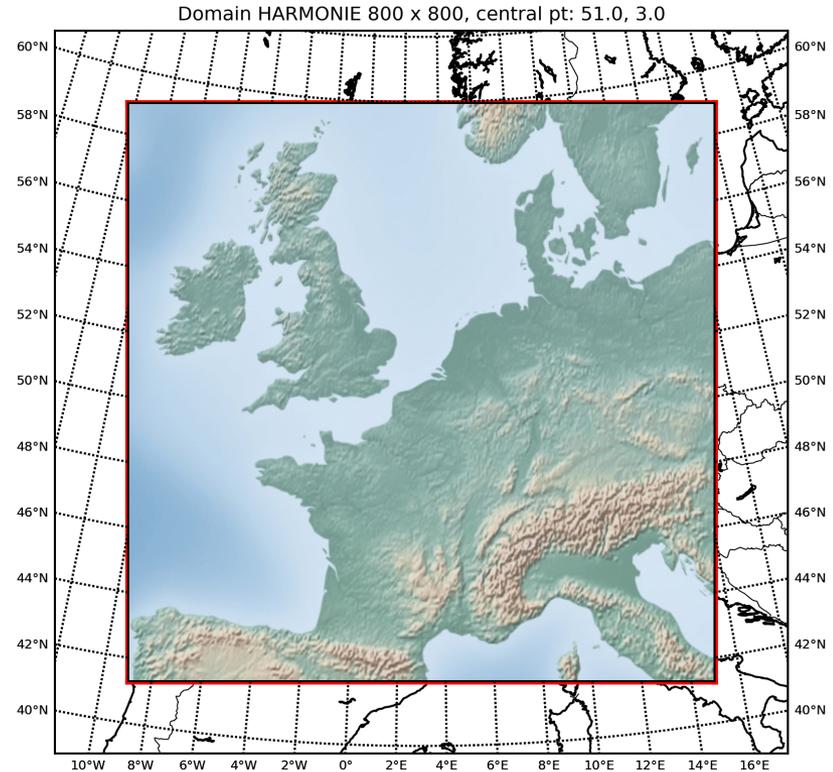
Jan Barkmeijer
Gert-Jan Marseille
Siebren de Haan
Wim Verkley
Cisco de Bruin
Wim de Rooy
Hylke de Vries
Xiaohua Yang (DMI)

Experiment IMPACT



Royal Netherlands
Meteorological Institute
Ministry of Transport,
Public Works and Water Management

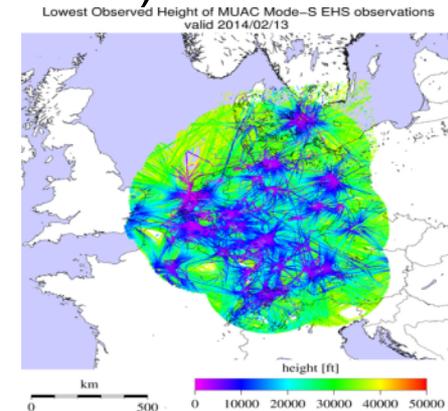
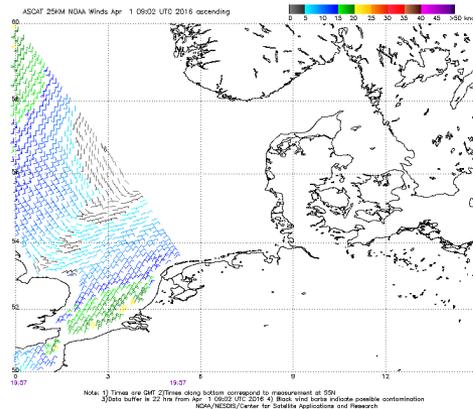
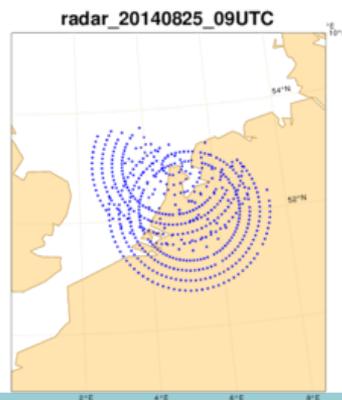
- Cycle 38h1.2
- NL area 800x800 grid points
- 3DVAR and 4DVAR
- Analysis cycle 1 and 3 hours
- Period: 15 Nov.– 31 Dec. 2013
(includes Mandela storm)



IMPACT (2)



- NOBS (3dvar, but no obs; surface analysis)
- CONV (3dvar, only conventional obs)
- SCAT (CONV + SCATTEROMETER)
- MODES (CONV + MODE-S EHS)
- 4DVAR (CONV + MODE-S EHS, 2 hour obs window with 7 sub-windows)
- RADAR (Reflectivity and Radial wind)
- HARATU (CONV + Harmonie-Racmo turbulence scheme)
- GNSS
- MSG (Cloudmasking)

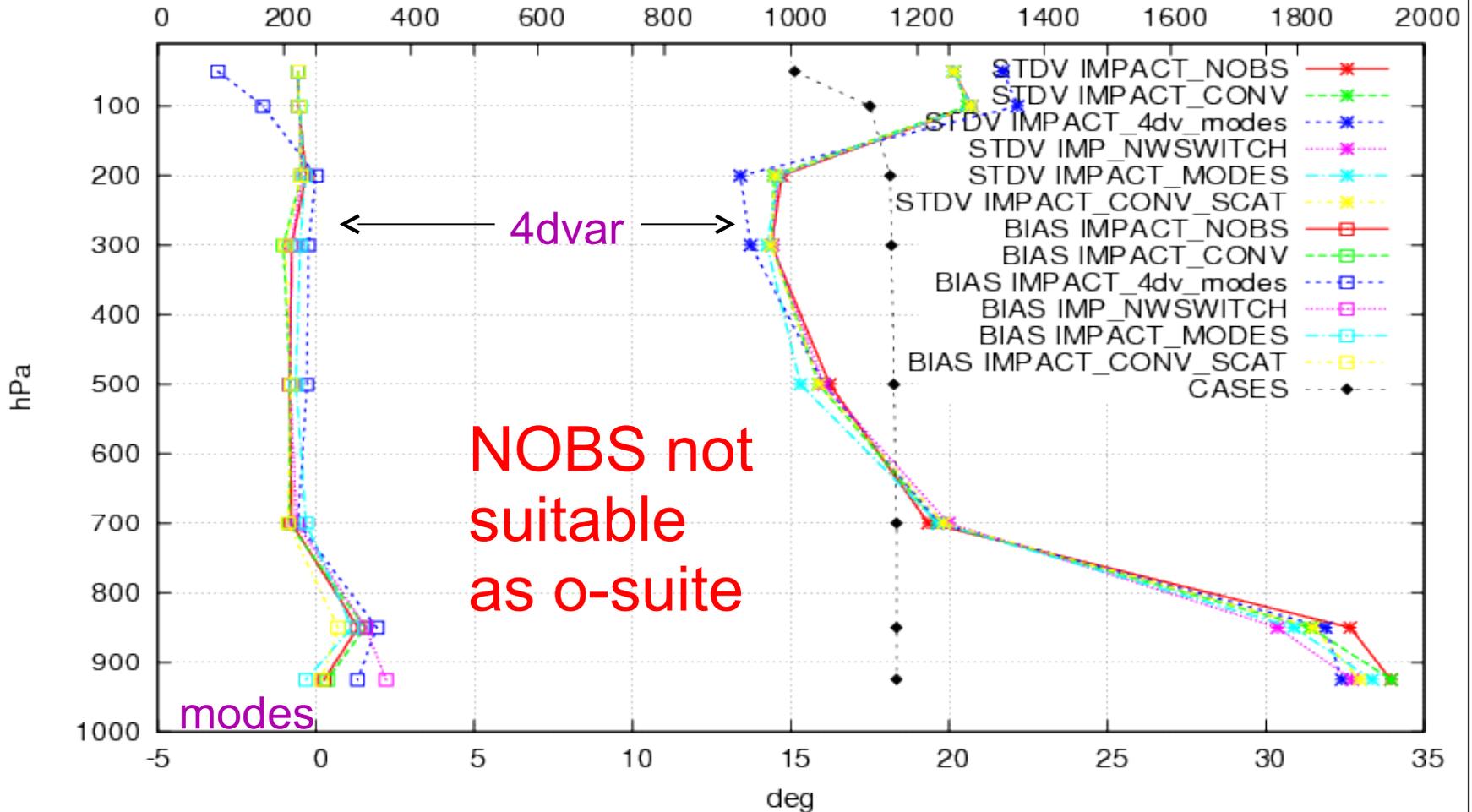




26 stations Selection: ALL

Wind direction Period: 20131115-20131231
Statistics at 00 UTC Used 00,12 + 12 24

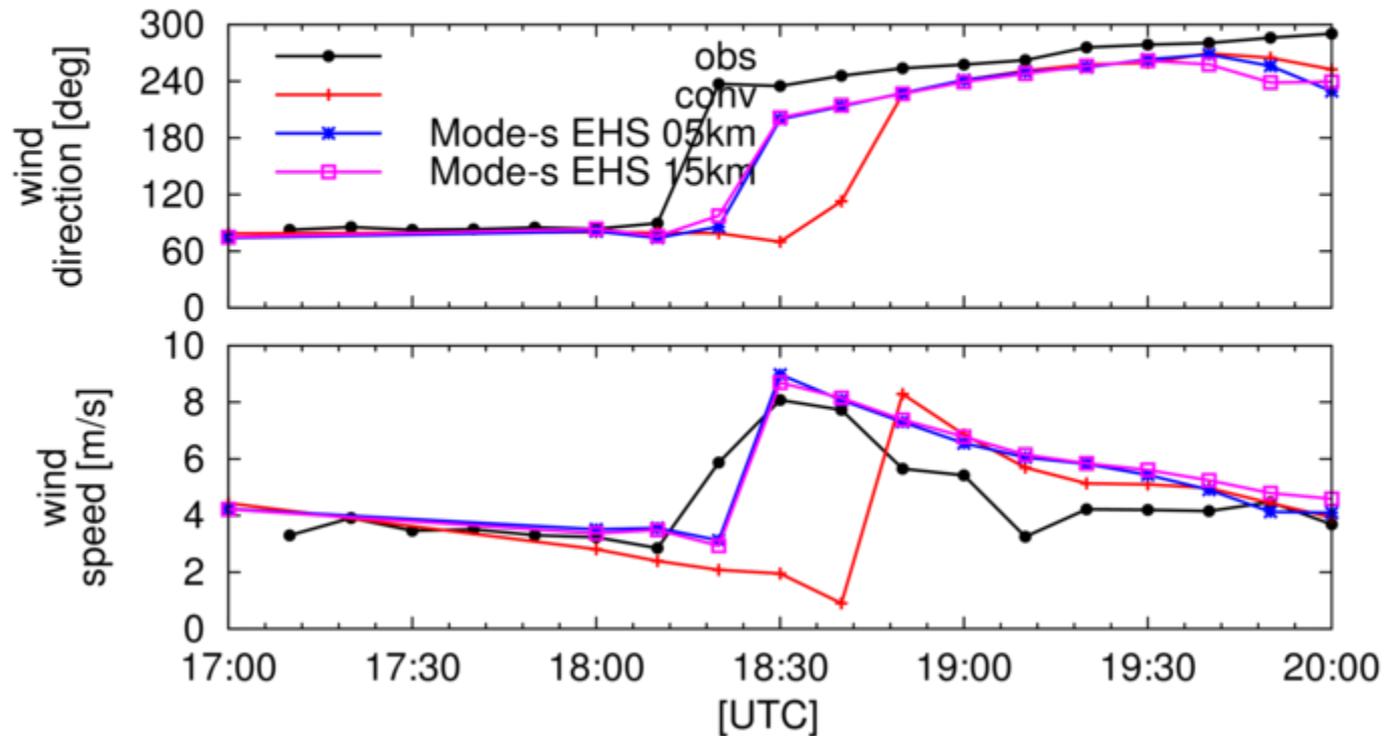
No cases





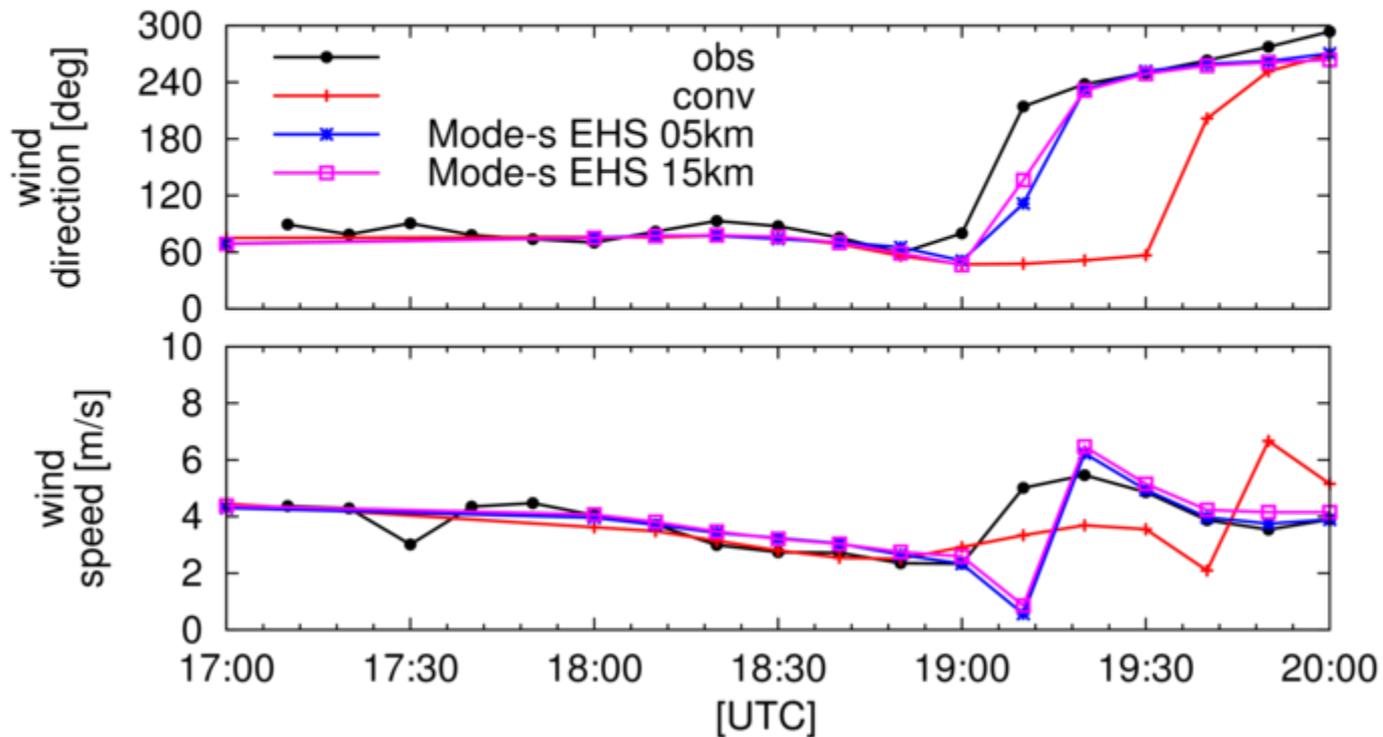
MODE-S EHS: improved 3DVAR timing of a passing front

10 m height validation Cabauw





10 m height validation De Bilt

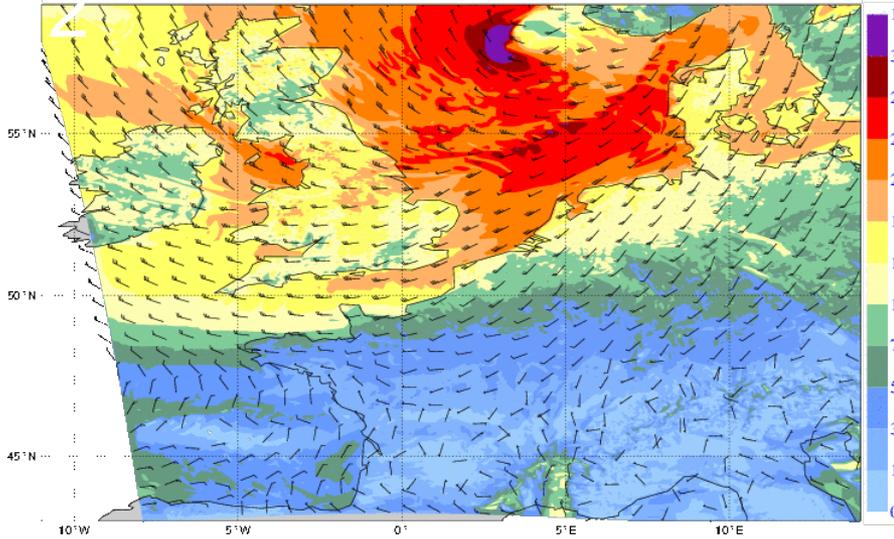




Mandela STORM: 5 Dec 2013

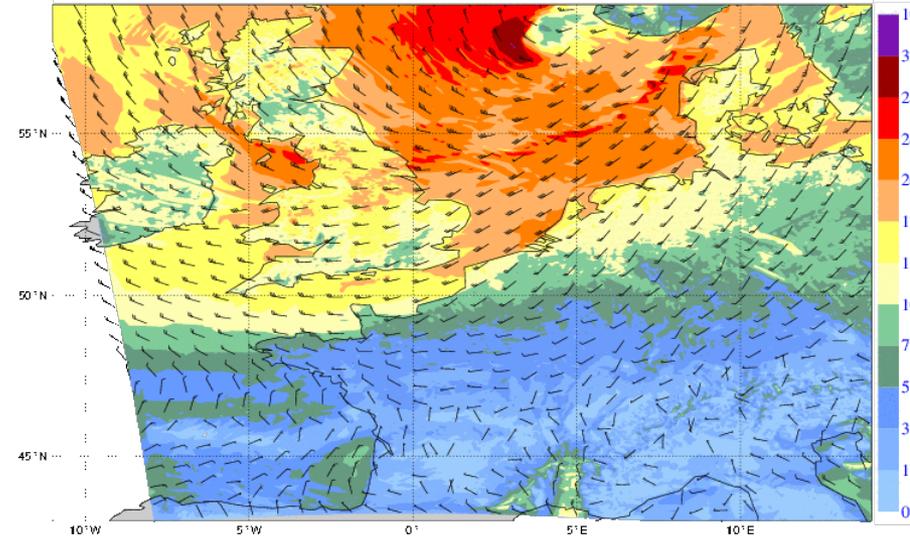
CONV

HA-U10; CONV; verification time: 2013120512UTC



CONV+SCAT

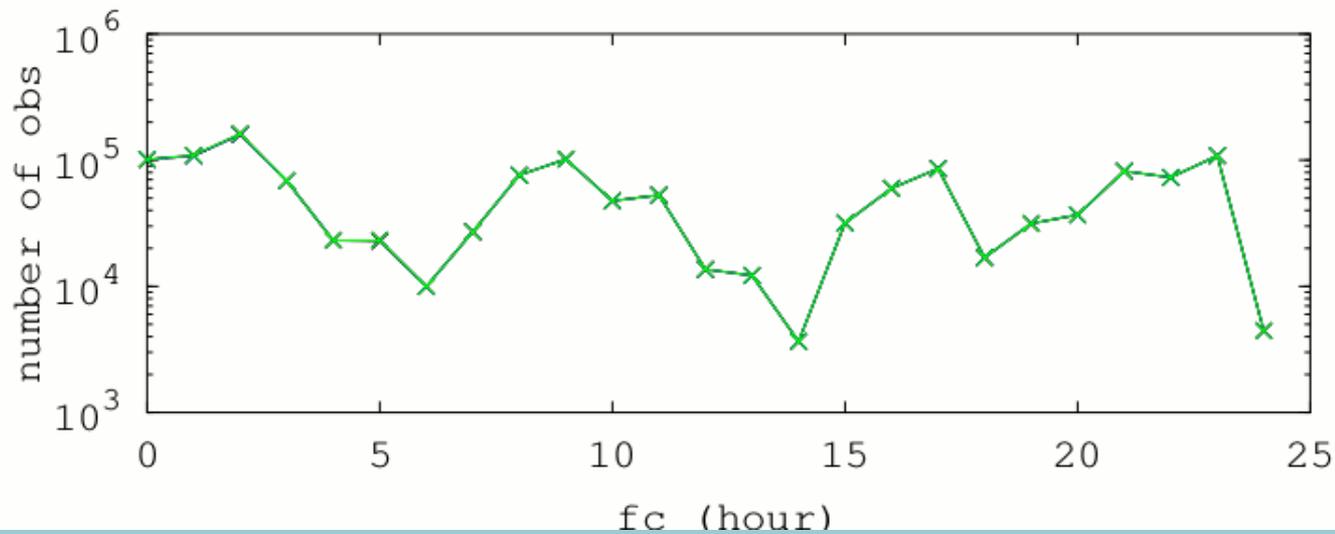
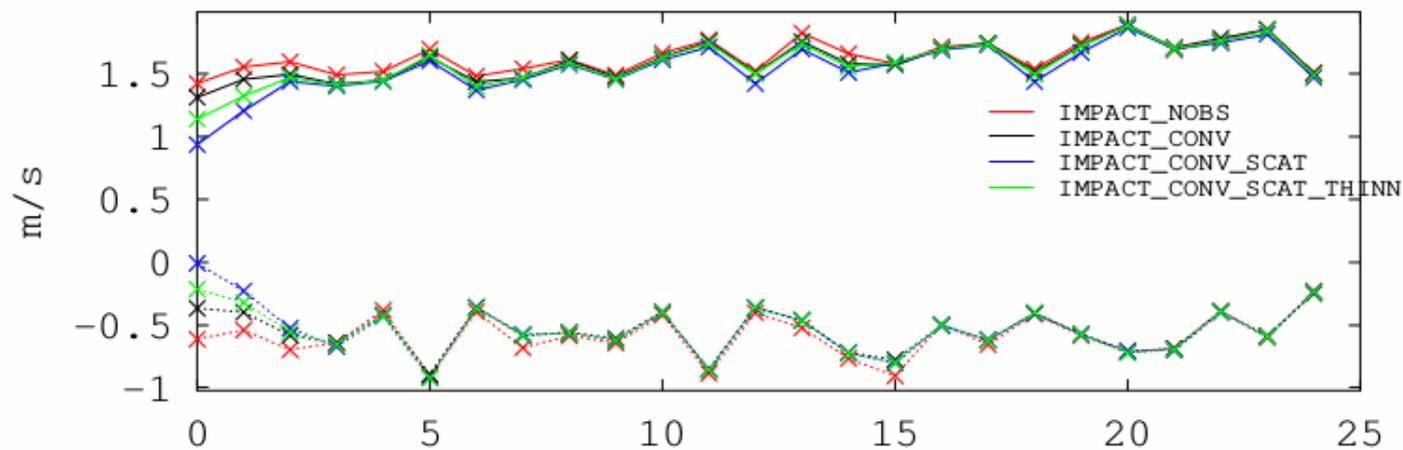
HA-U10; CONV+SCAT-NOTHINN-3h; verification time: 2013120512UTC



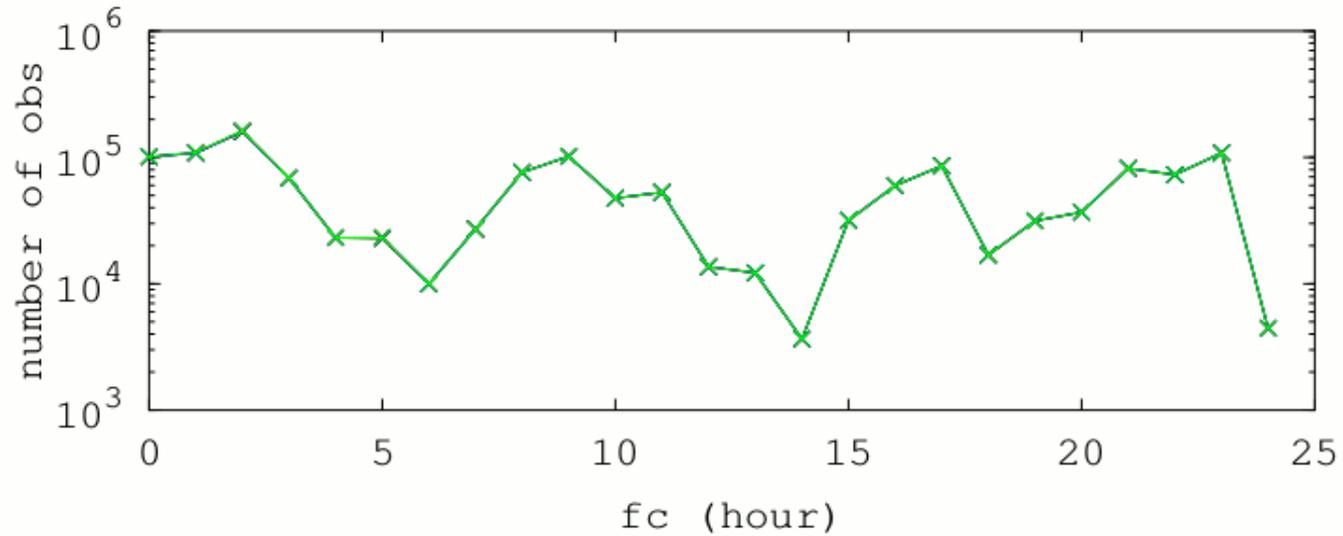
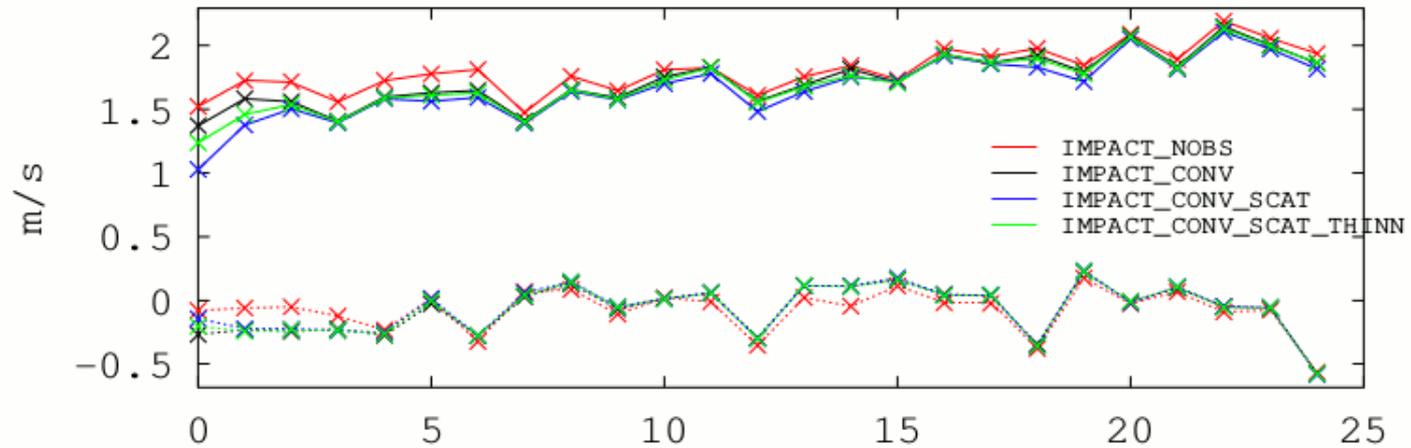
~ ECMWF



(o-f) u-10m over sea for scat



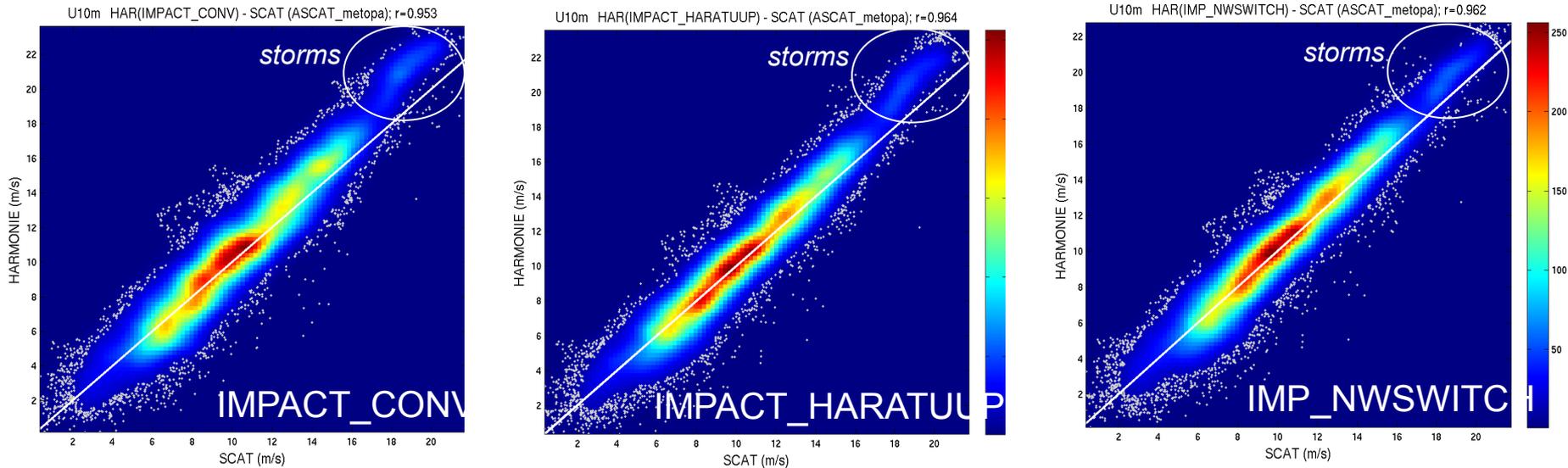
(o-f) v-10m over sea for scat



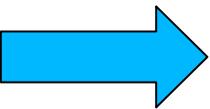
Harmonie (T+3) vs. ASCAT-Metop-A



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- Harmonie exaggerates strong wind (over sea)
- Better match (closer to diagonal/less broad) for HARATU (over sea)
- Performance for wind speed $>18\text{m/s}$ probably related to drag relation



Promising combi:

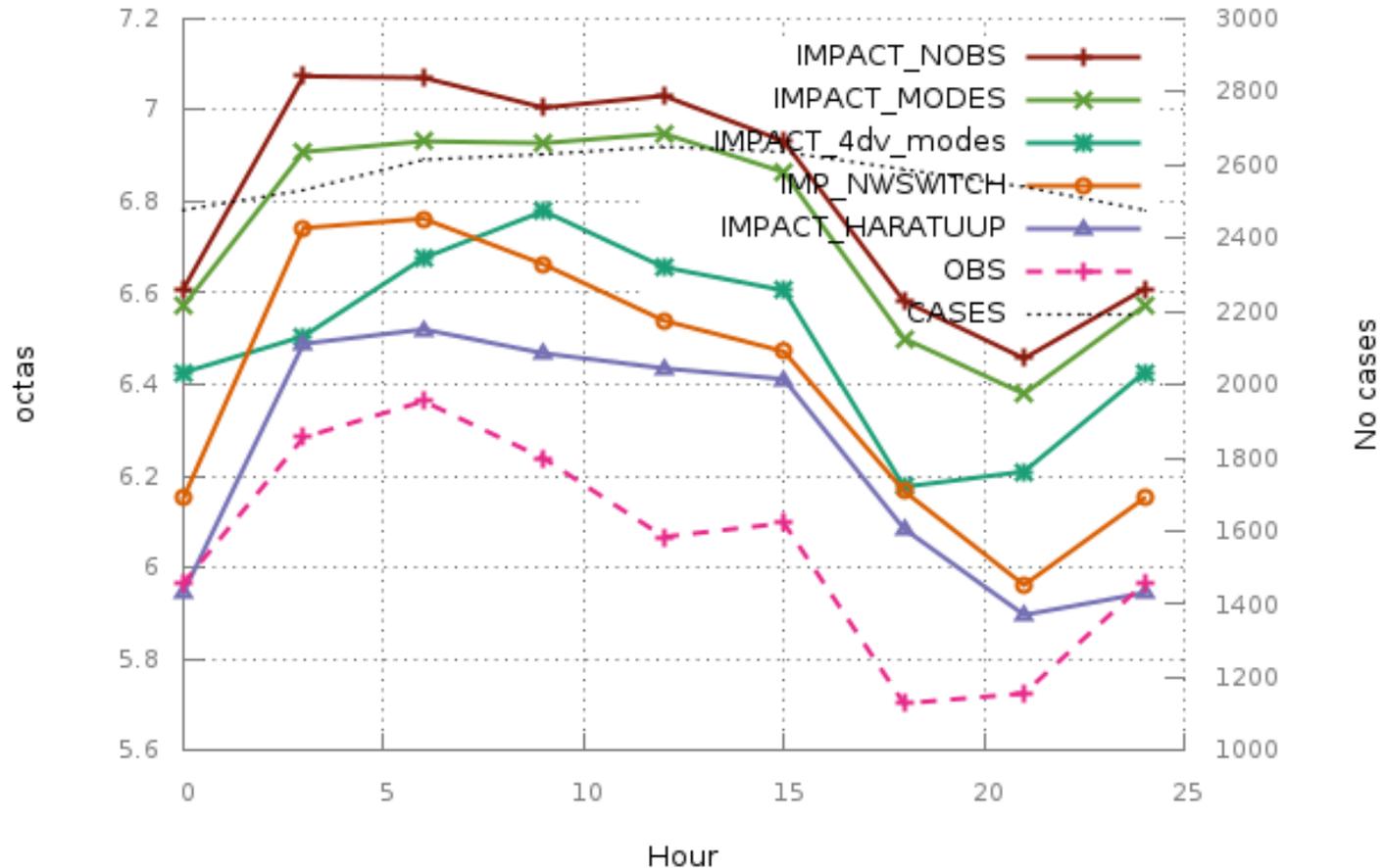
Harmonie (ASCAT) data assimilation + HARATU

IMPACT on cloud cover



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Selection: Netherland using 67 stations
Cloud cover Period: 20131116-20131231
Used {00} + 03 06 09 12 15 18 21 24

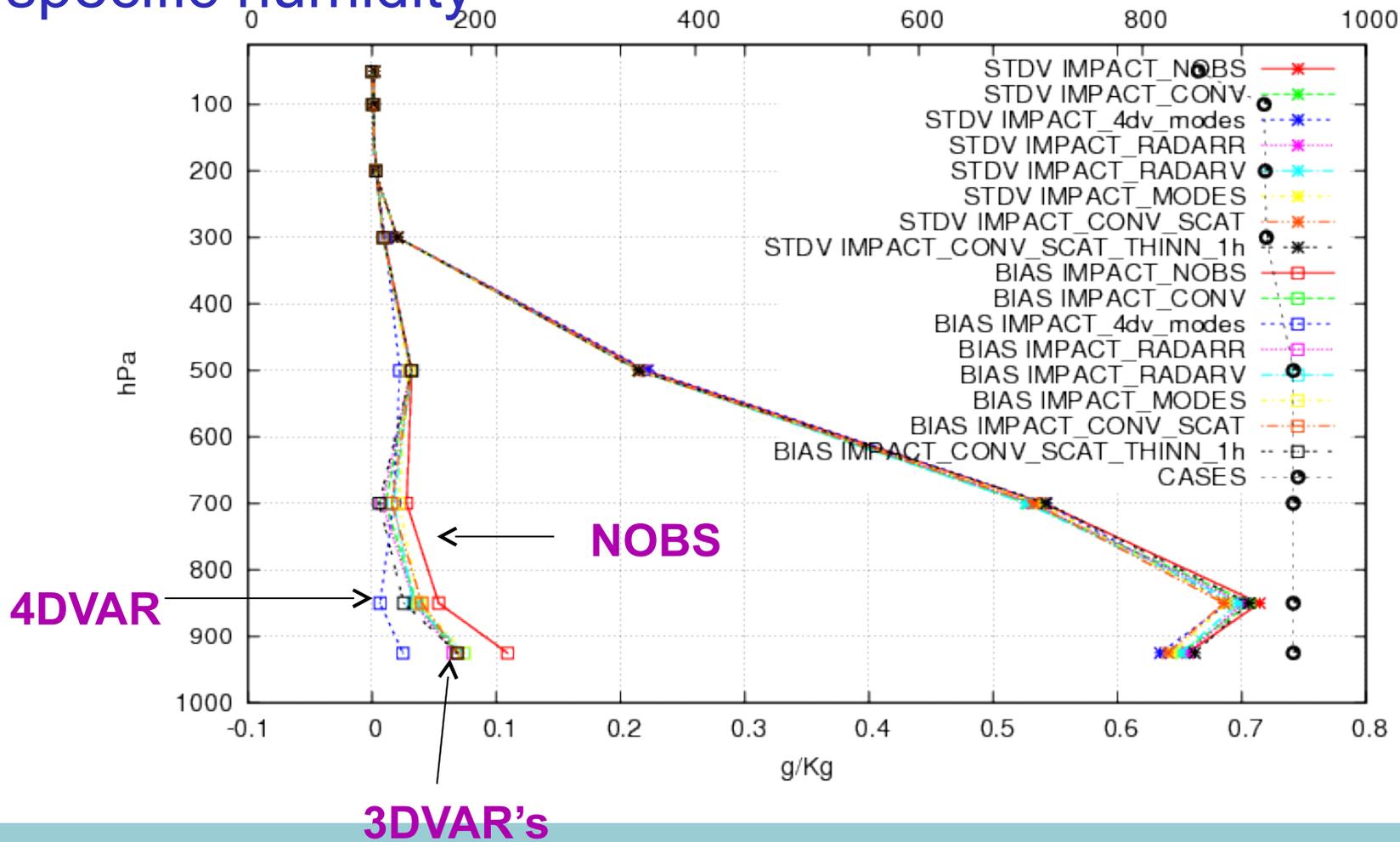




bias and std specific humidity

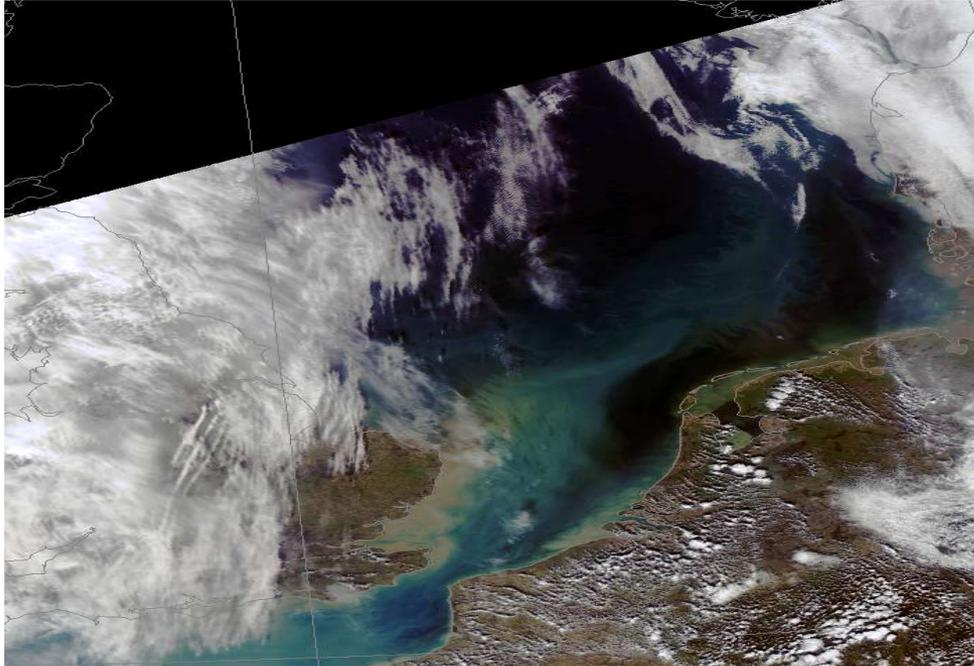
26 stations Selection: ALL
Specific humidity Period: 20131115-20131231
Statistics at 12 UTC Used 00,12 + 12 24

No cases

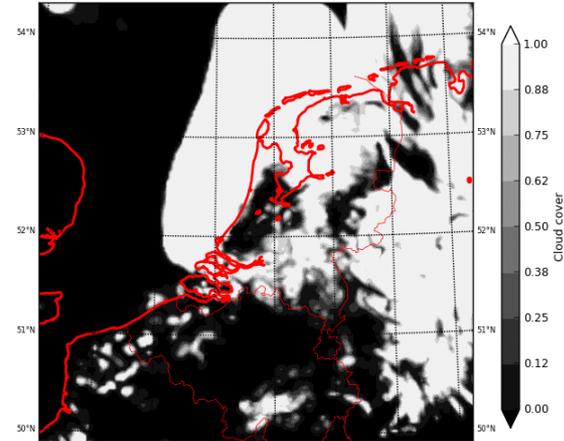




FOG or no FOG: 5 March 2014 12UTC +12h

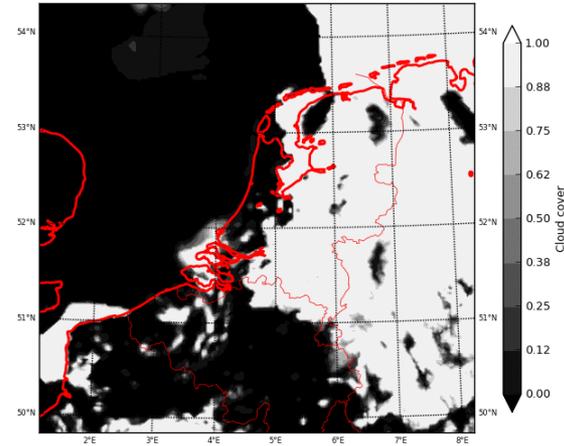


Harmonie (BULL, small area): par 71:sfc:0
at 2014030512+000, validtime 2014030512



CONV

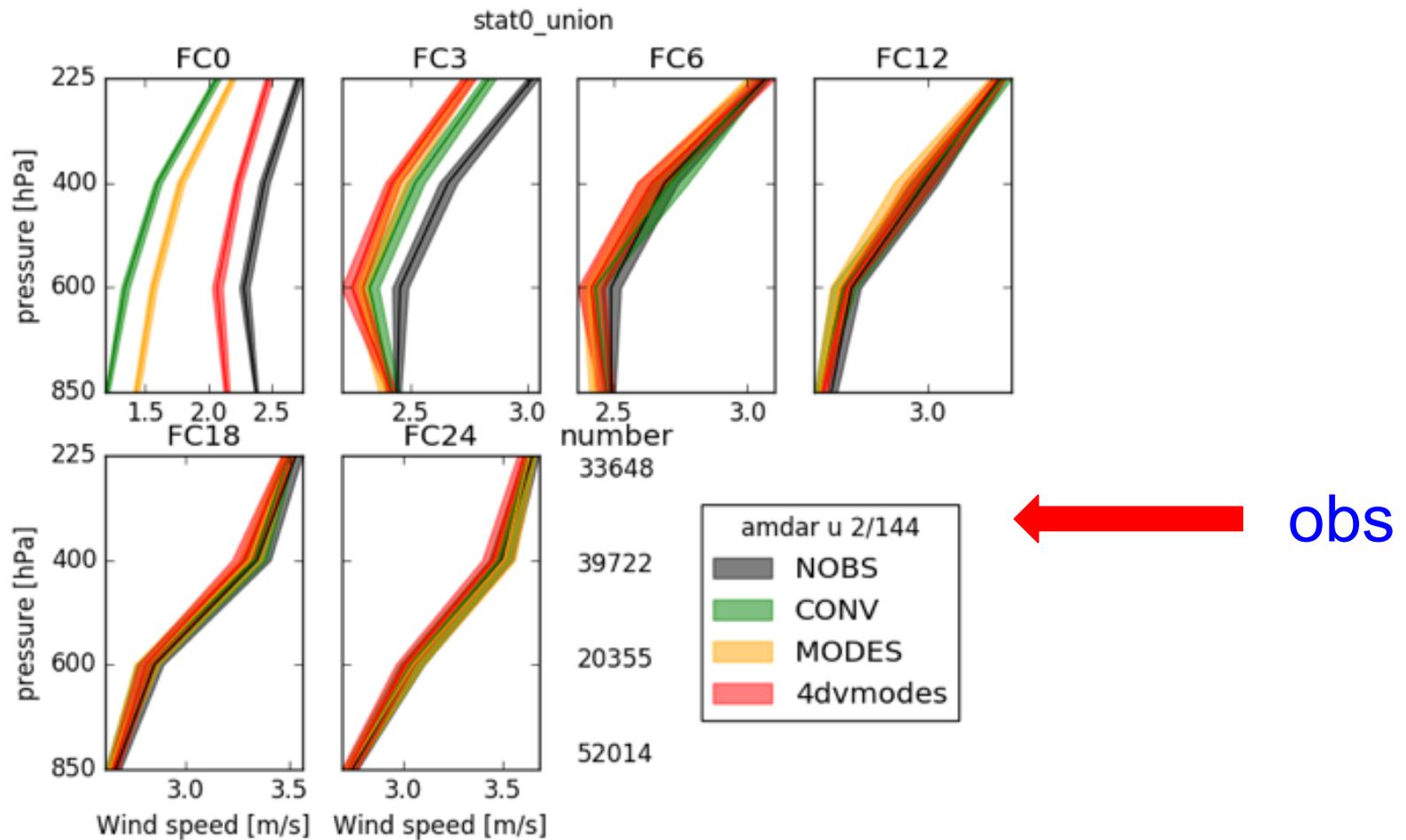
Harmonie (4DVAR): par 71:sfc:0
at 2014030512+000, validtime 2014030512



**4DVAR
+
mode-s**



o-f behaviour of 3dvar vs. 4dvar (10 sets o-f)

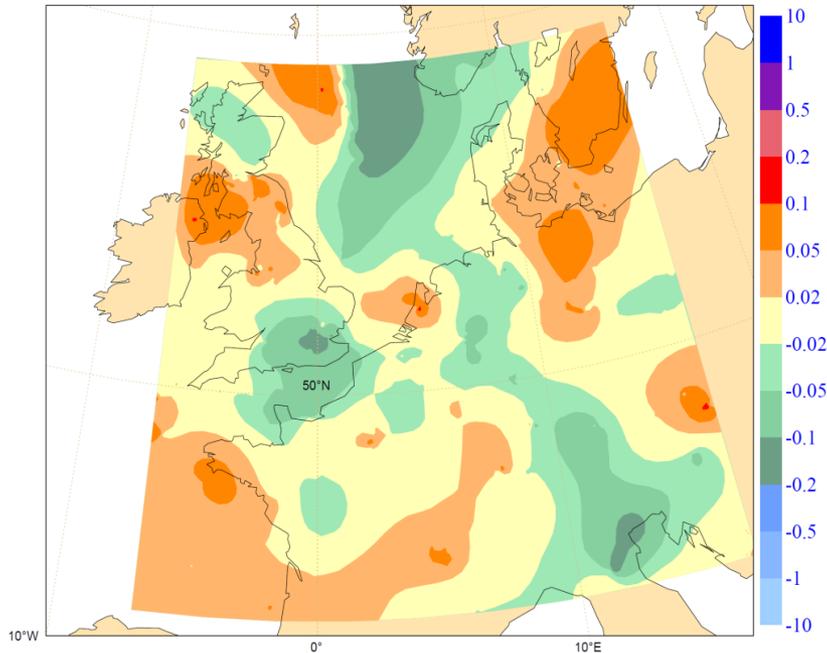




Humidity analysis increment and its evolution

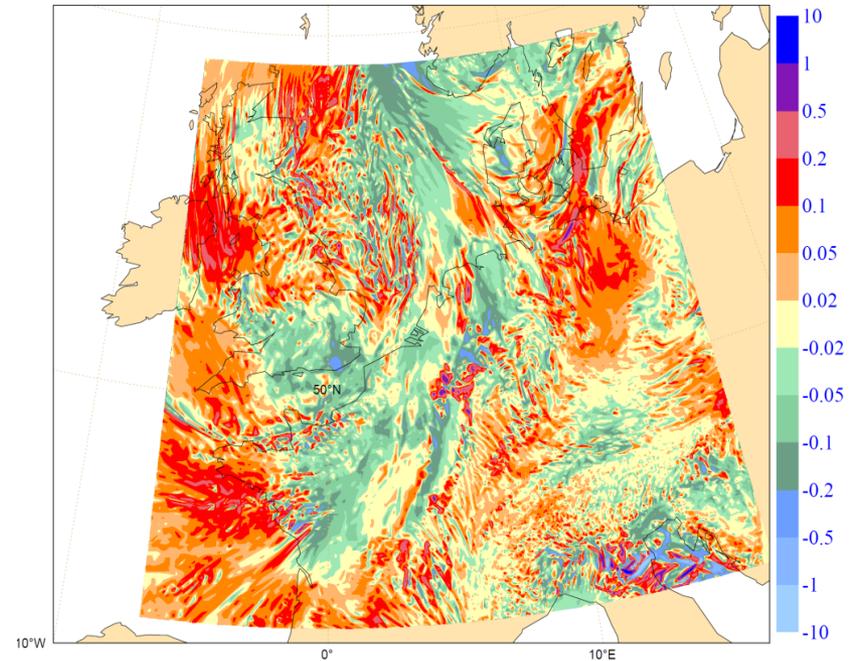
3Dvar Harmonie increment (FC+0)

ML 51; q (g/kg) analysis increment at 2013112015UTC; exp. IMPACT_CONV



3Dvar Harmonie evolved increment (FC+1)

ML 51; q (g/kg) evolved analysis increment at 2013112016UTC; exp. IMPACT_CONV



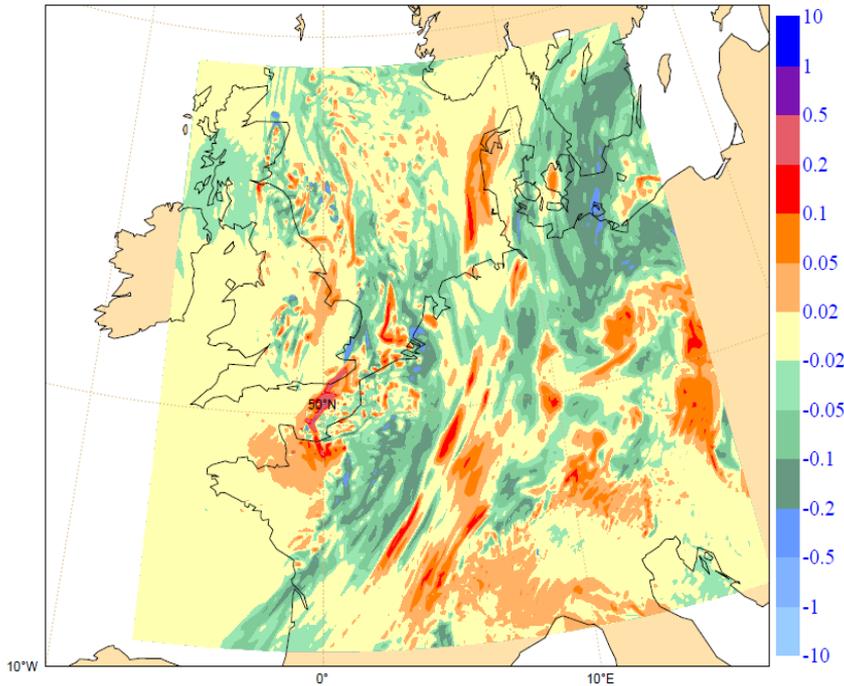
Low correlation between increment and 1-hour evolved increment for humidity
Strong growth on small-scales, but is it correct?



Humidity analysis increment and its evolution

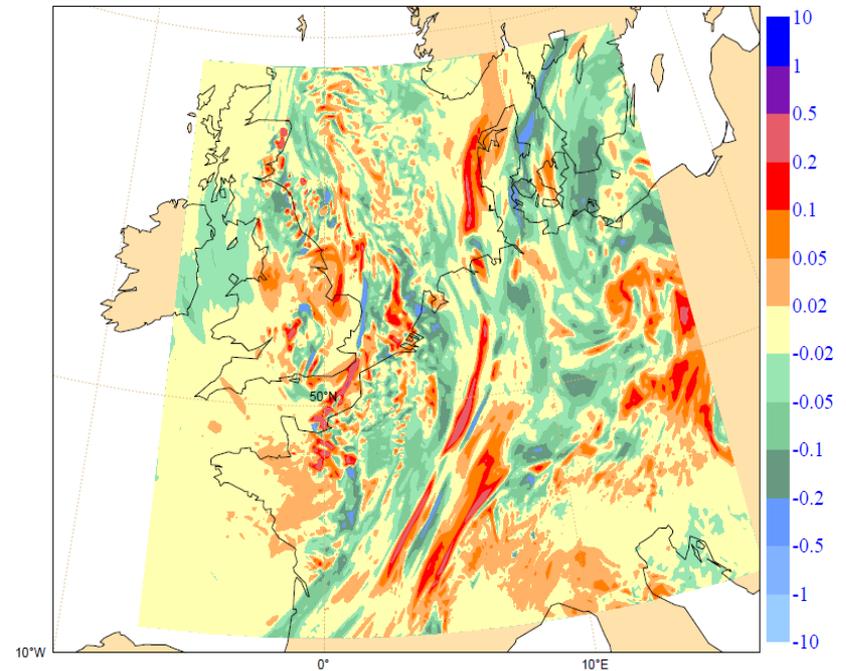
4Dvar Harmonie increment (FC+0)

ML 24; q (g/kg) analysis increment at 2013112015UTC; exp. IMPACT_4dv_modes



4Dvar Harmonie evolved increment (FC+1)

ML 24; q (g/kg) evolved analysis increment at 2013112016UTC; exp. IMPACT_4dv_modes



Good correlation between increment and 1-hour evolved increment for humidity



Conclusions-Outlook

- ❖ Observations definitely contribute to an improved forecast performance, but impact
 - i) is usually short-lived (~3h for 3dvar)
 - ii) for different obs sets generally quite similar

- ❖ Wind DA (scat and mode-s) and Haratu seem a promising match.

- ❖ 3dvar suffers from the climatological B?

- ❖ 4dvar results (increment evolution, q-profile) warrant further exploration and obs set will be extended with Radar, Scatterometer and GNSS (possibly with 1-h analysis cycle)

- ❖ KNMI has started a CY38 3DVAR e-suite (Haratu, Mode-s EHS, Scatterometer, and soon Radar (F, B, Ire, DK))