Scatterometer winds at Météo-France: usage and new datasets

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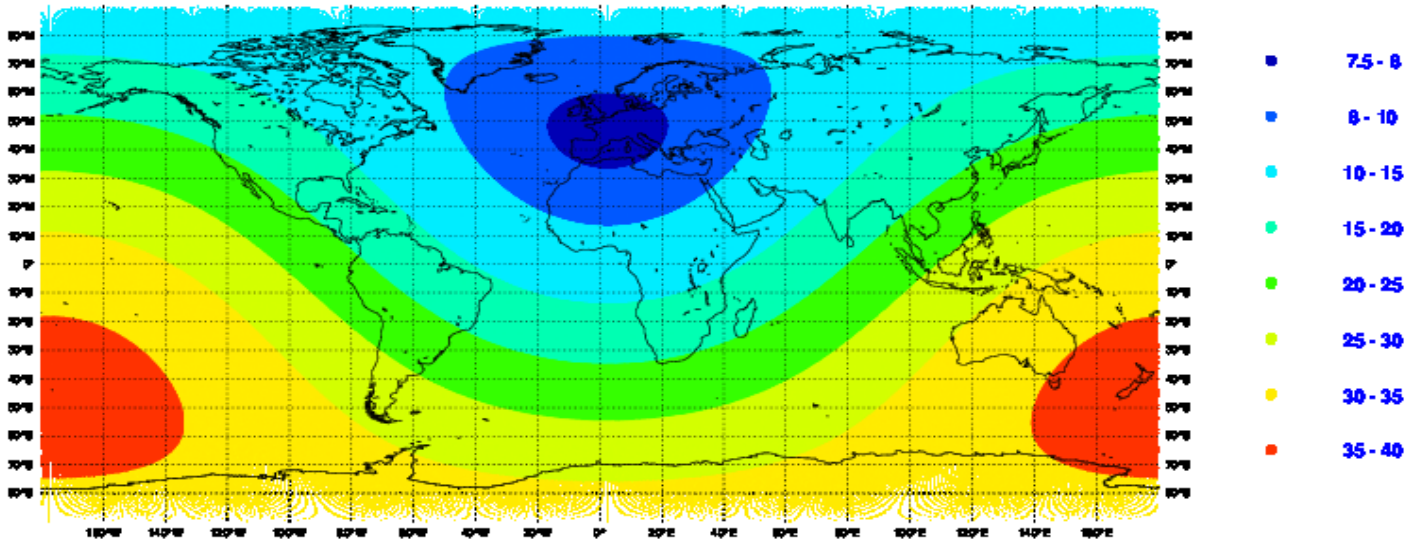
Outline

- Model update (global) and scatterometer winds use
- Impact of scatterometer winds in the ensemble assimilation
- RapidSCAT (ISS) and HSCAT (HY-2A) winds, 50km product, EUMETSAT OSI SAF L2B processing (KNMI)

Global model ARPEGE update (April 2015)

Main features of the last version switched operational in April 2015:

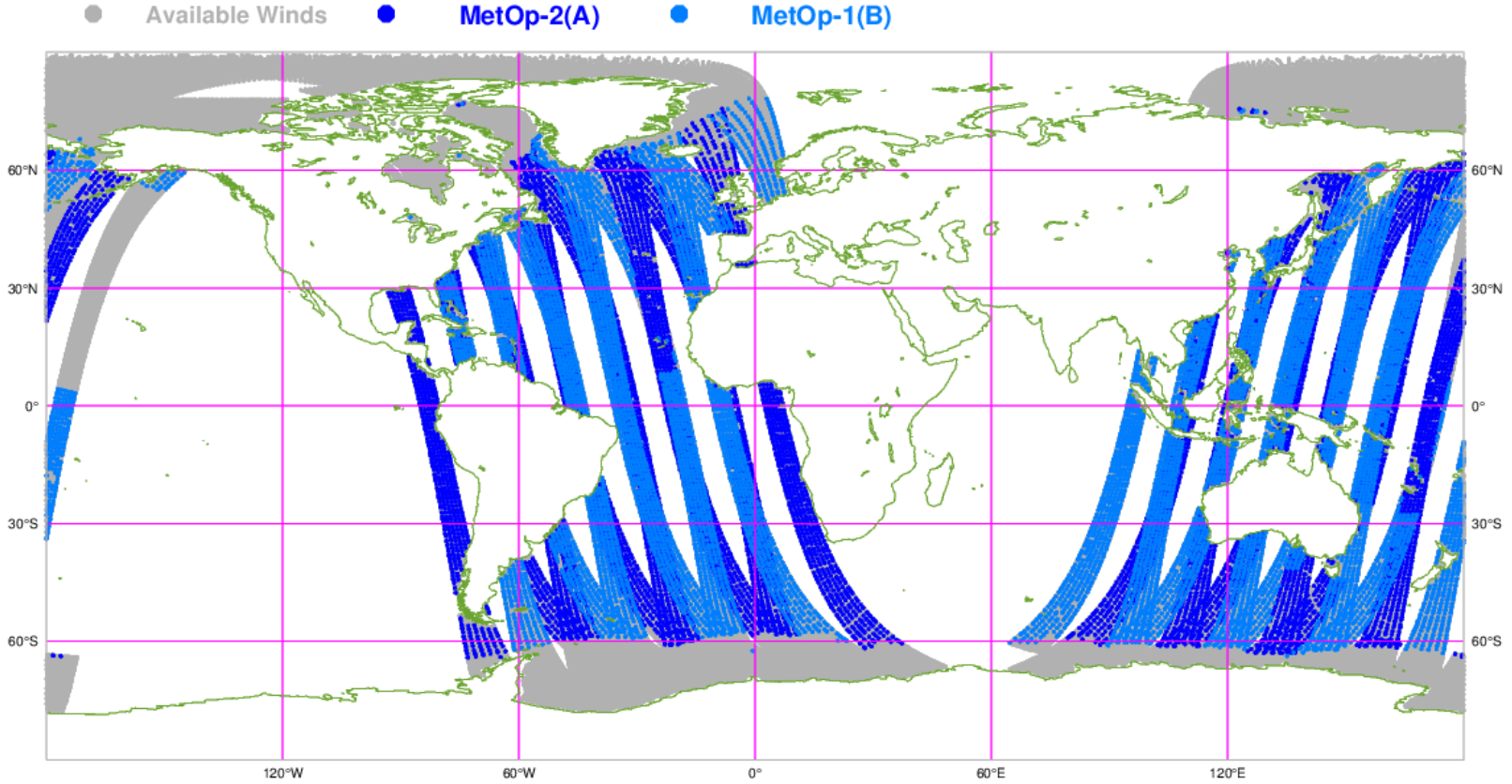
- Resolution: T1198c2.2 (between 7.5 and 36km), L105 (~10m to 0.1 hPa)
- Assimilation: 4D-Var, 6 hours window, 30' timeslots, with 2 inner loops (40 + 40 iterations), T149 (~135km) and T399 (~50km)
- Background variances given by AEARP, 25 members, T479 L105 (~40km), 1 inner loop T149L105, 1.5 day average for covariances, update every 6 hours



ARPEGE resolution T1198C2.2 in km

Scatterometer winds use on 6 hours

After the OSCAT loss in February 2014, only ASCAT instruments (A&B) available for the assimilation (EUMETSAT OSI SAF product)



Scatterometer winds **available**

Data assimilated: **ASCAT-A**, operational since Feb 2008

ASCAT-B, operational since July 2013

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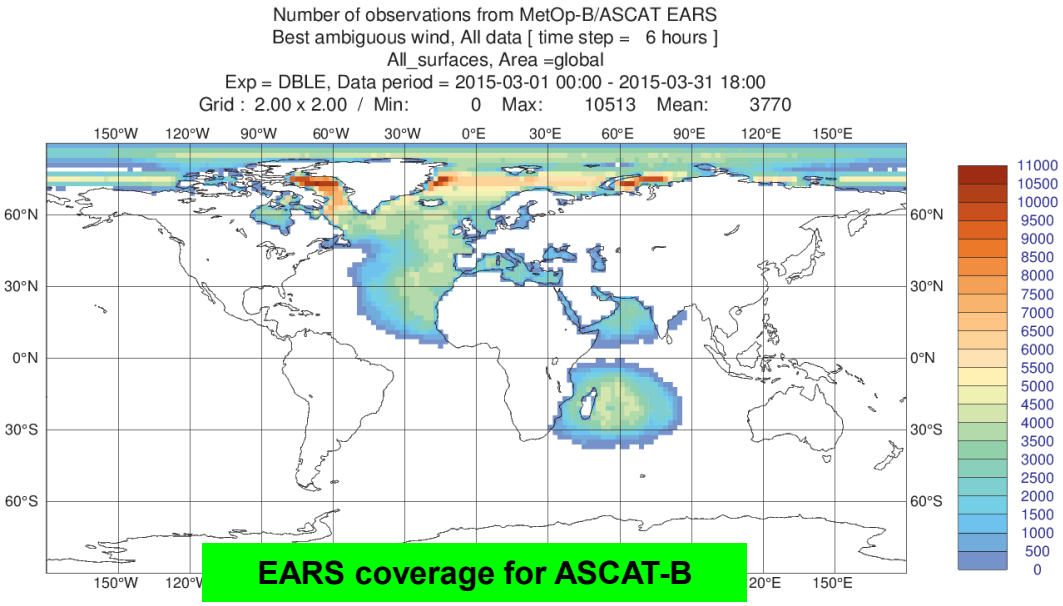
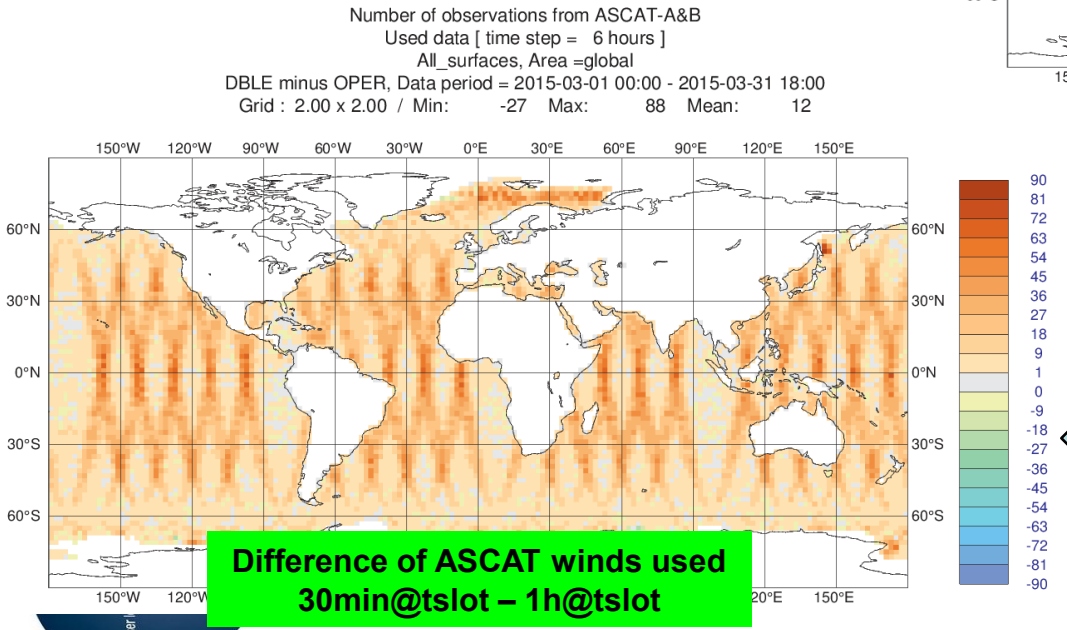
Scatterometer winds use

ASCAT-B from EARS service used

Timeliness of around 30 min, instead of 1 hour for the global stream (ADA service).



EARS coverage for ASCAT-B



Difference of ASCAT winds used 30min@tslot – 1h@tslot

Timeslots of 30 min instead of 1 hour

More assimilated data towards the equator where ASCAT swaths overlap and separated only by 50 min, +5% globally.

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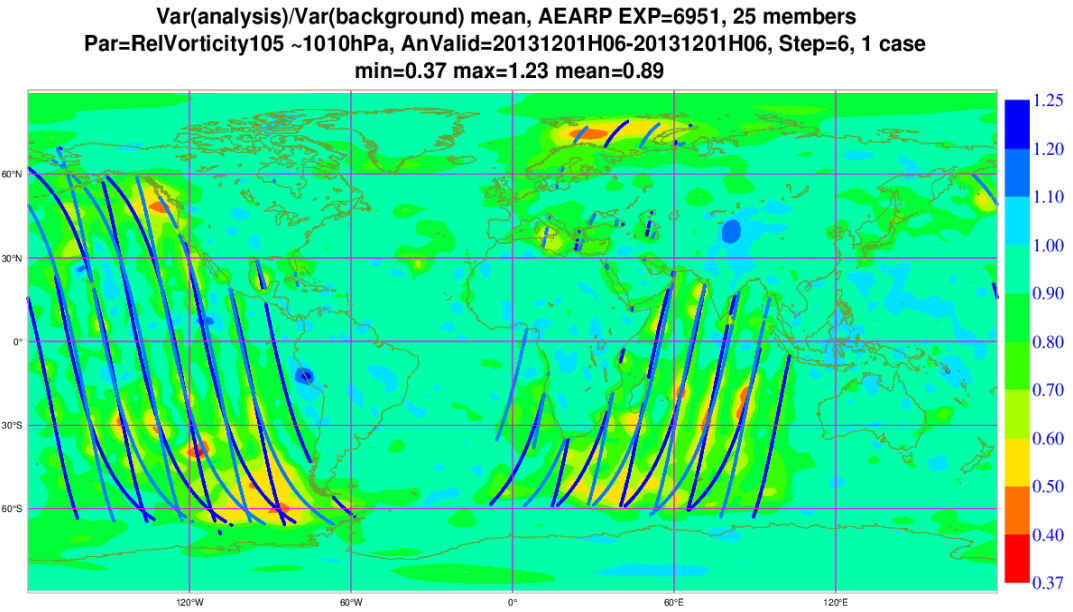
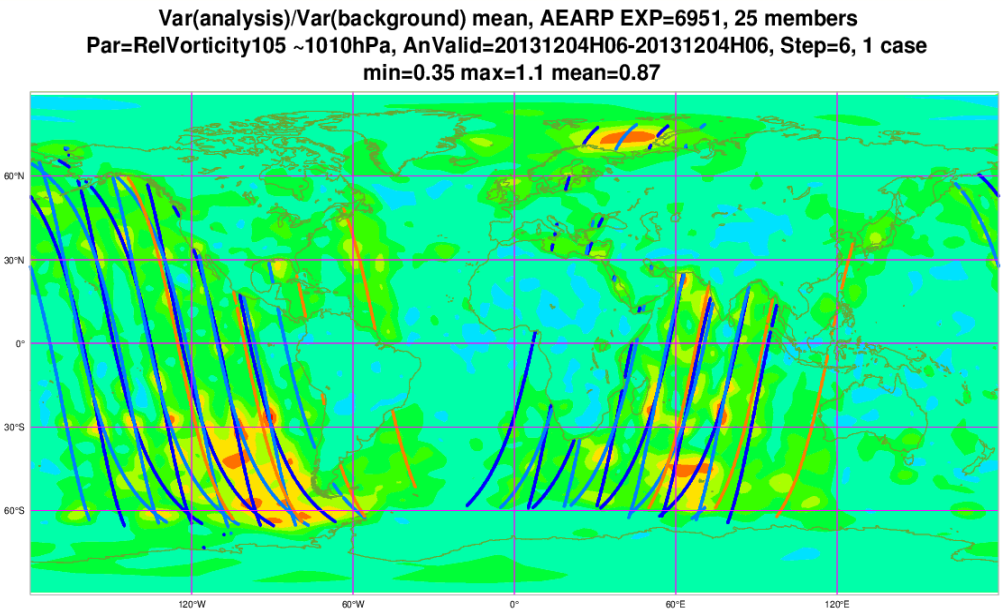
Scatterometer winds impact, ensemble assimilation AEARP



ASCAT-**A** & **B**, OSCAT **missing**



Same thing 3 days later, **OSCAT** is back

Error variance reduction (σ^2_a/σ^2_b) for relative vorticity at 10 m

- Correlated to scatterometer swaths over oceans (winds present)

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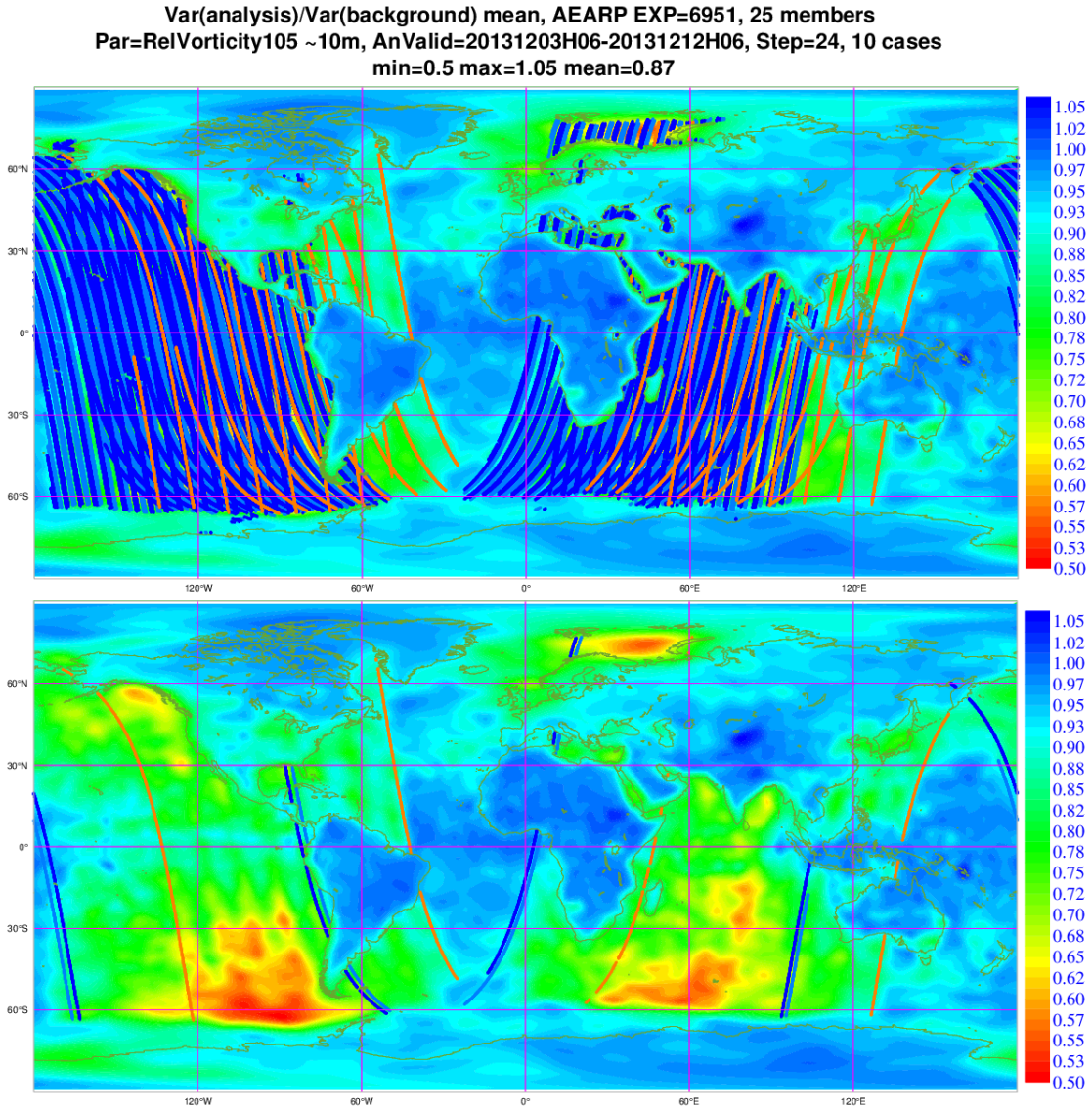
Scatterometer winds impact, ensemble assimilation AEARP



- ASCAT-**A** & **B**, **OSCAT** ground tracks of the swath edges (right/left) for the 6 UTC assimilation run (on 10 days)
- ~40 orbits by platform are represented, the OSCAT frame is looser because the orbit repeats every 2 days (~5 orbits by orange line)

- Same data, but only the extreme swath edges for each satellite on the period are plotted
- Overlarge areas of variance reduction when the swaths of ASCAT-A and ASCAT-B separate and with OSCAT overlaps

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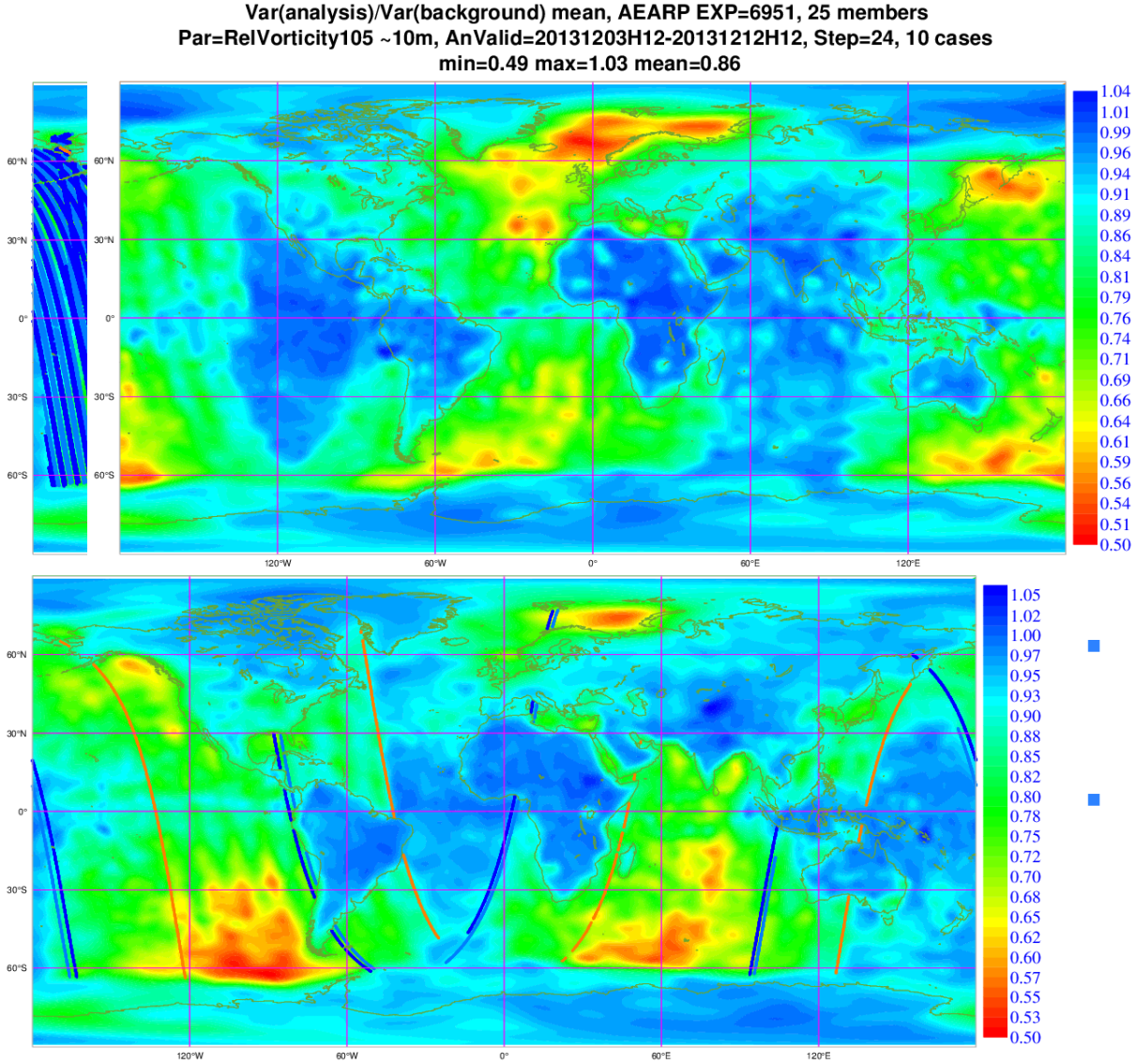
Scatterometer winds impact, ensemble assimilation AEARP



- Scatterometer winds impact also the north hemisphere but at 12 UTC (as here) and 0 UTC

- Same data, but only the extreme swath edges for each satellite on the period are plotted
- Overlarge areas of variance reduction when the swaths of ASCAT-A and ASCAT-B separate and with OSCAT overlaps

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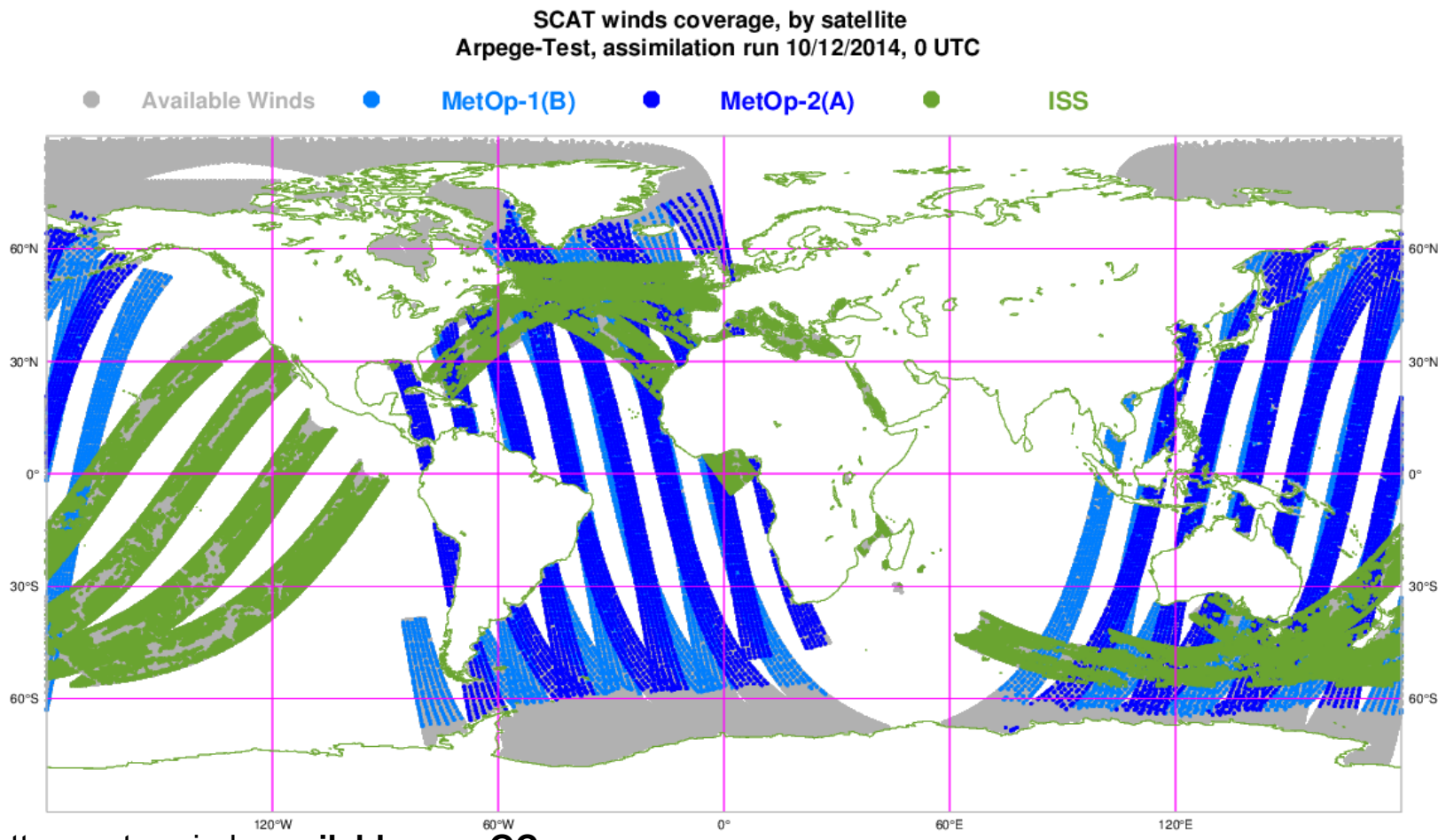
RapidSCAT (ISS) from the OSI-SAF (KNMI) on 6 hours



Scatterometer winds **available**

Data assimilated:

- **ASCAT-A**
- **ASCAT-B**

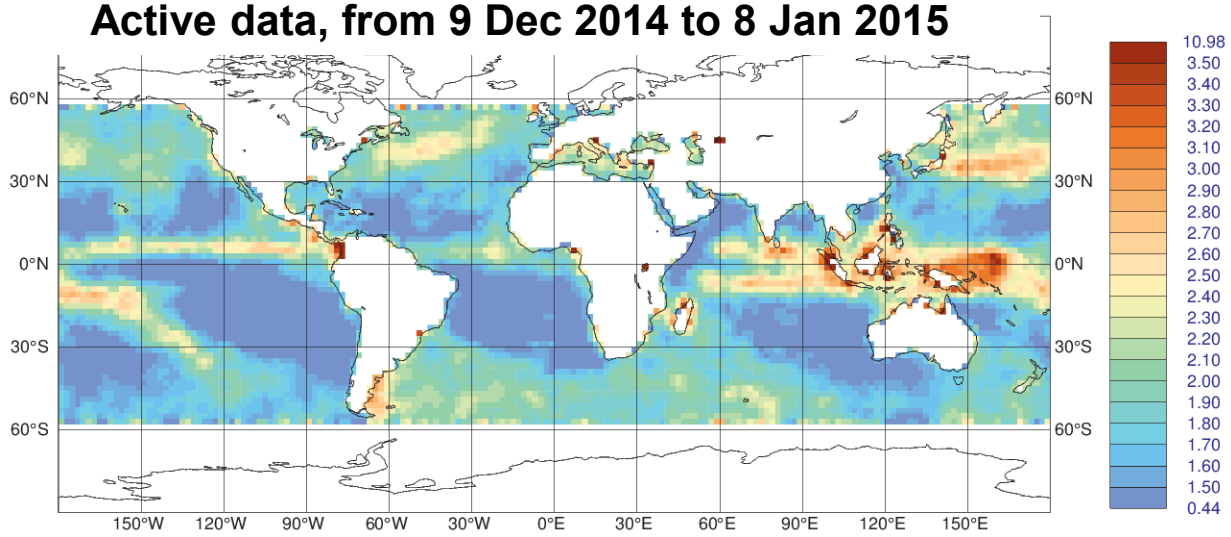
QC success:

- **RapidSCAT:** ftp dissemination started in Dec 2014 (test), operational status since March 2015, available on EUMETCAST since yesterday!

For access, contact the KNMI OSI SAF team.

50km RapidSCAT winds

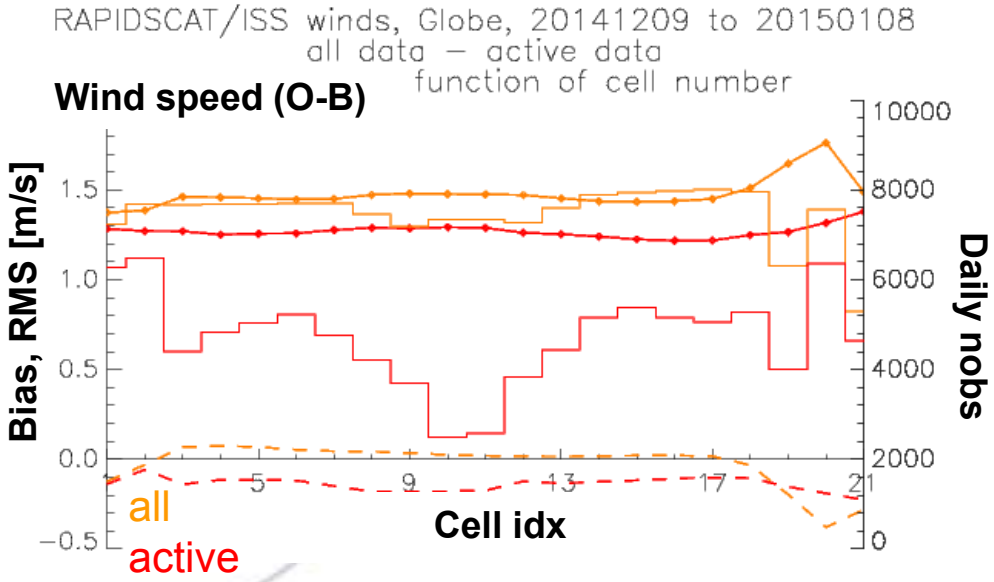
RapidSCAT winds RMSVD to model background
Active data, from 9 Dec 2014 to 8 Jan 2015



- RMSVD to model bkgrd similar to ASCAT statistics (after quality control, mainly rain effect removal)
- Highest differences along the ITCZ the Gulf Stream and the Kuroshio
- On average, RapidSCAT RMSVD is close to 1.8 $m.s^{-1}$, 13° for direction RMS, 1.3 $m.s^{-1}$ in speed

Statistics along the cross-track index show:

- a speed bias of -0.14 $m.s^{-1}$ (after QC)
- ISS solar panels effect removed after QC (on the right side of the swath)
- rejection rate by the QC around 35%, as with OSCAT



RapidSCAT assimilation, 3 tests (t1), (t2) and (t3)
33 forecasts at 0 UTC, from 10/12/2014 to 11/01/2015

Normalized RMS scores / radiosondes [%]:

Improvement — Degradation --- Neutral impact Significance at 99 % (bootstrap)

t1: as OSCAT	t2: (t1) +25m/s W.Spd thld.	t3: (t2) +100km thinning
NORTH20 – Z score		
TROPICS – Wind score		
SOUTH20 – Z score		

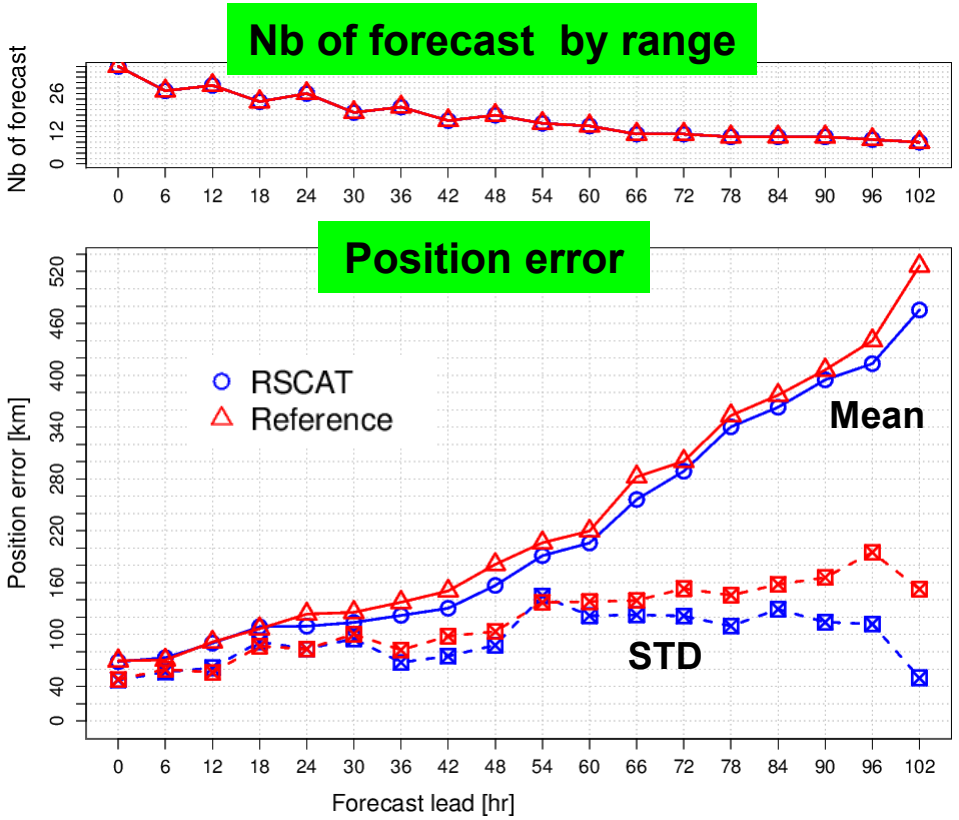
Pressure level [hPA]

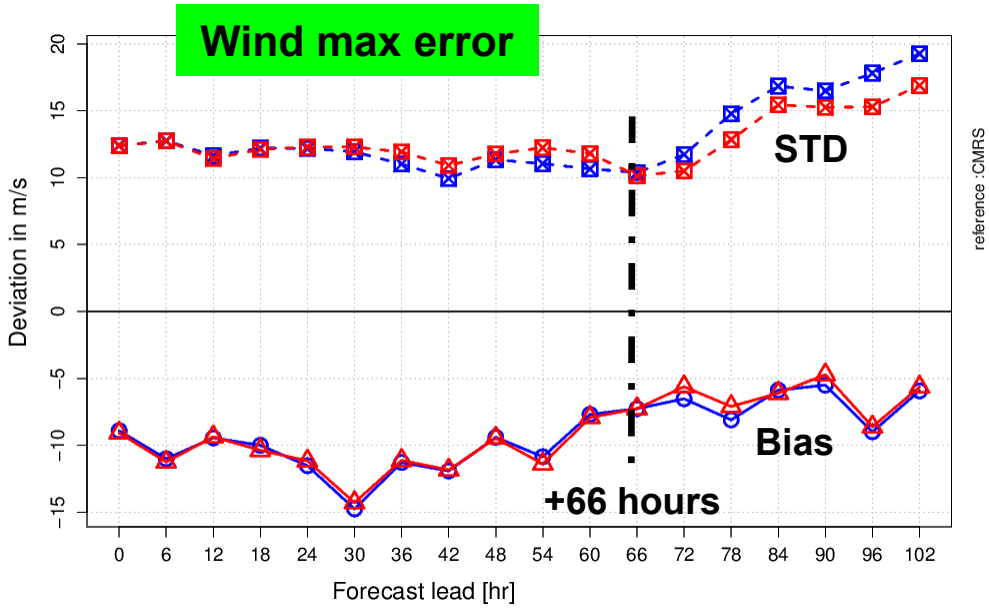
Forecast range [hour]

RapidSCAT assimilation as OSCAT
47 forecasts at 0 UTC, from 10/12/2014 to 25/01/2015

Tropical Cyclones forecast scores* / best tracks:

*provided by the LACy (Réunion Island)

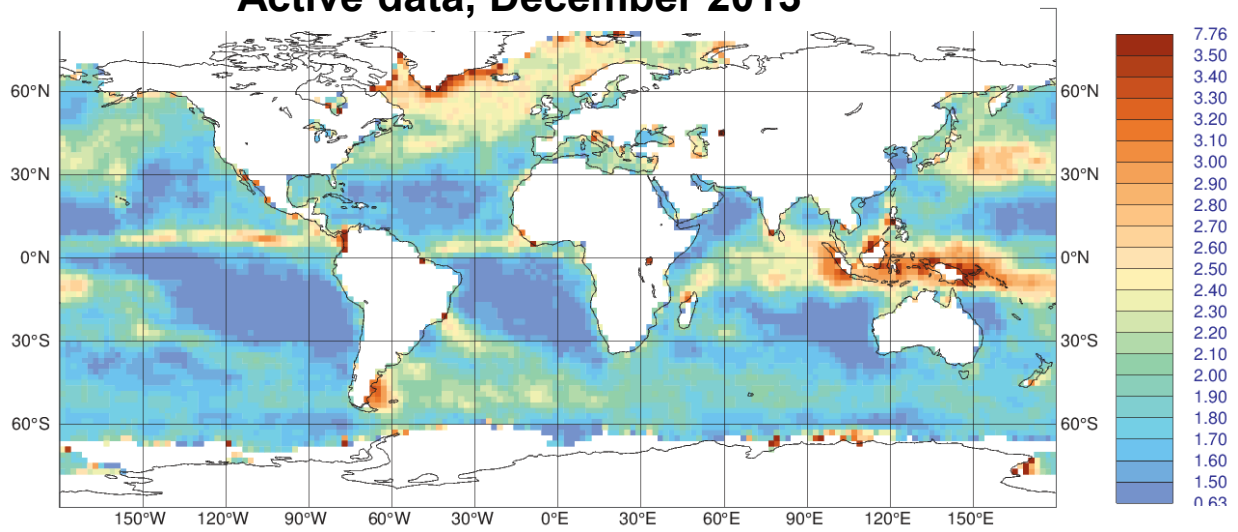




- Position error improvement at all fc-range.
- Wind max error: degradation beyond 3 days, mainly in standard deviation, light improvement before.

50km HSCAT (HY-2A), off-line dataset in Dec 2013

HSCAT winds RMSVD to model background
Active data, December 2013

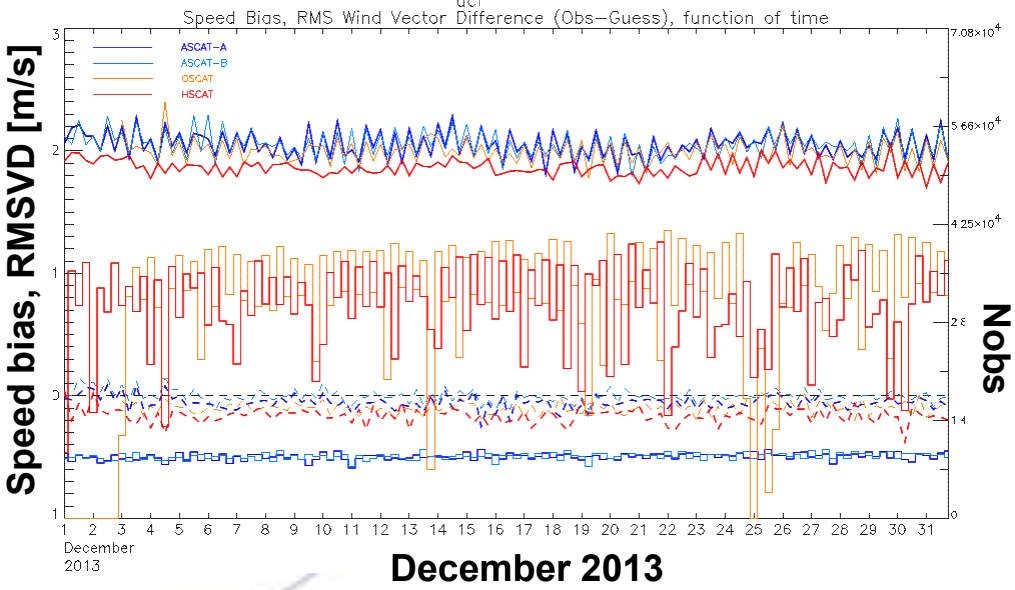


- RMSVD to model bkgrd similar to statistics with other instruments (after quality control)
- On average, HSCAT RMSVD is close to 1.9 m.s^{-1}, 13° for direction RMS, 1.3 m.s^{-1} in speed

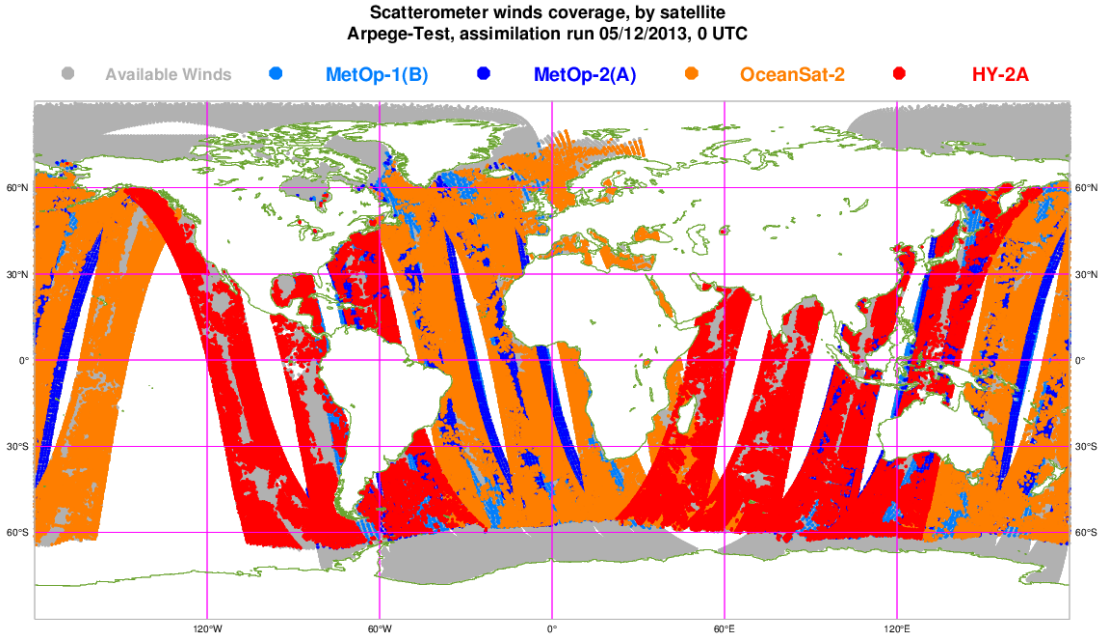
Statistics by assimilation run on Dec 2013 show:

- HSCAT RMSVD slightly lower than ASCAT and OSCAT
- a speed bias (-0.16 m.s^{-1}) slightly more negative (coming from the southern hemisphere)

(O-B) statistics after QC

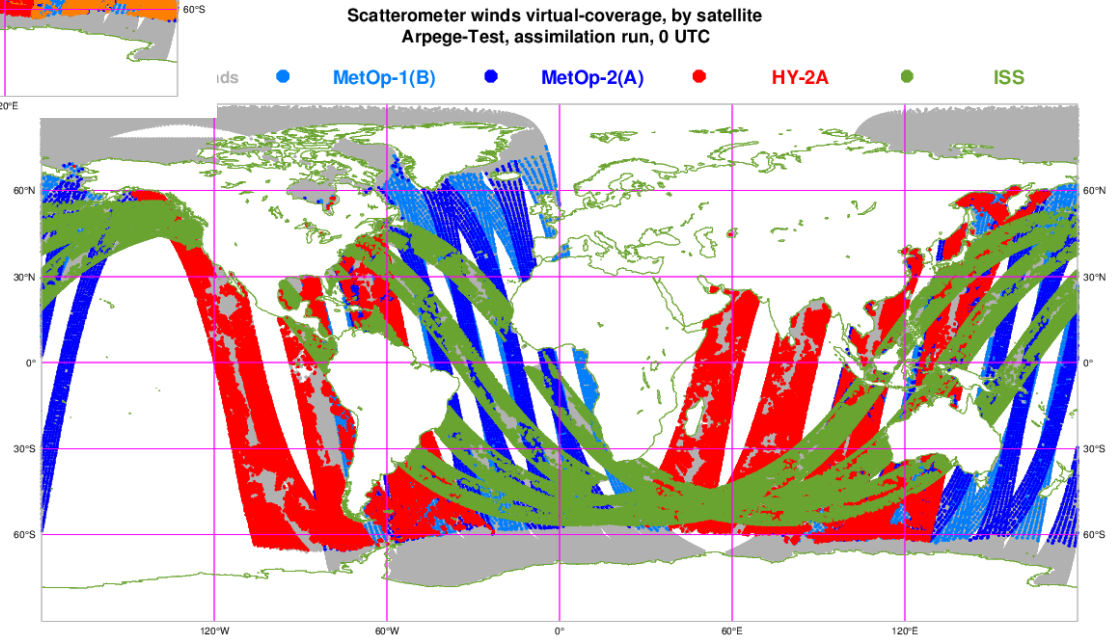


HSCAT winds coverage on 6 hours



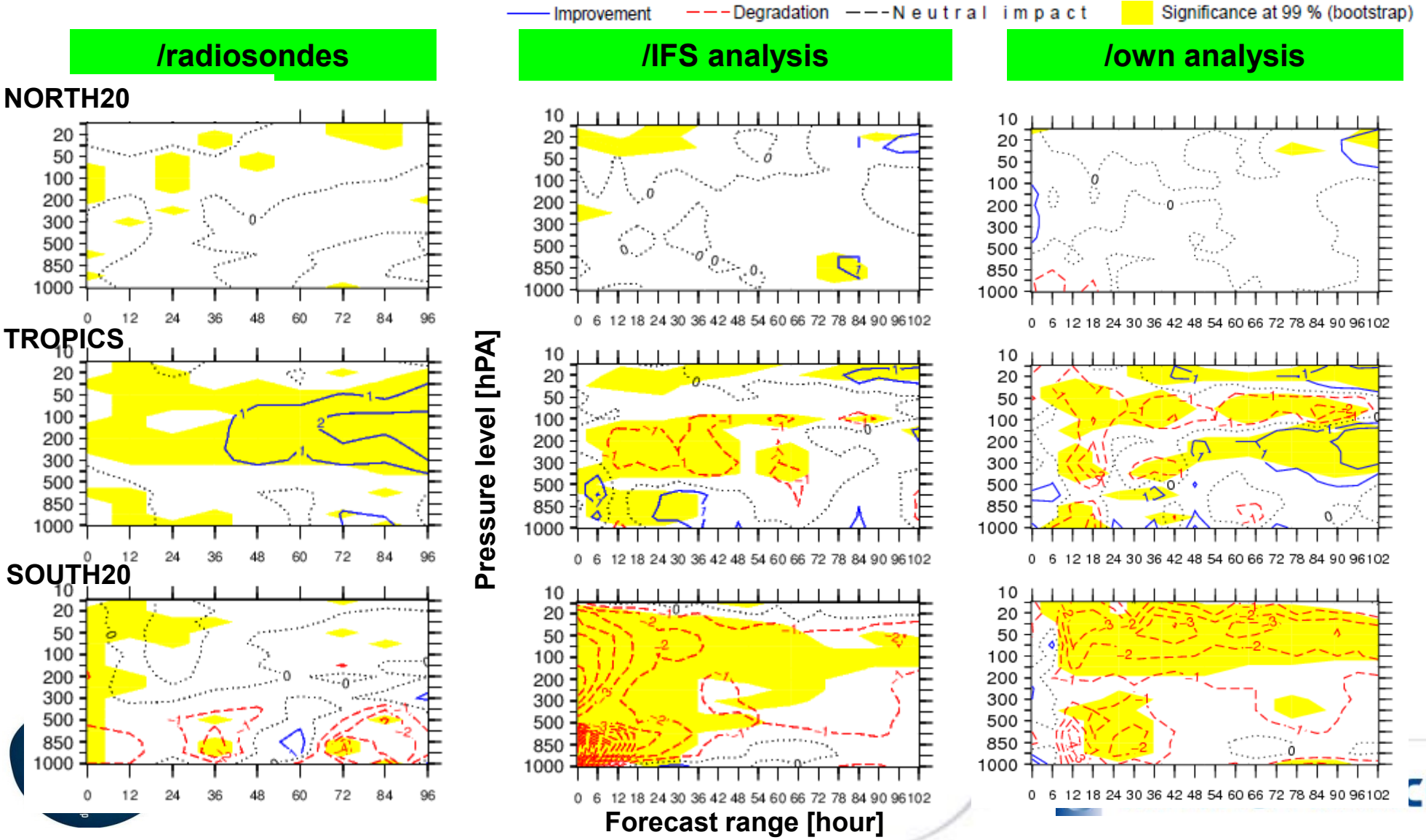
Scatterometer winds coverage before the loss of OSCAT, and with HSCAT added (for a 6 hours assimilation window, centred here on 0 UTC, December 2013)

Current virtual constellation of scatterometer winds, if ASCATs, HSCAT and RapidSCAT were used all together



HSCAT assimilation, test « as OSCAT »
31 forecasts at 0 UTC, December 2013

Normalized RMS Z scores [%]:



HSCAT assimilation, « as OSCAT »
31 forecasts at 0 UTC, December 2013

Tropical Cyclones forecast scores* / best tracks:

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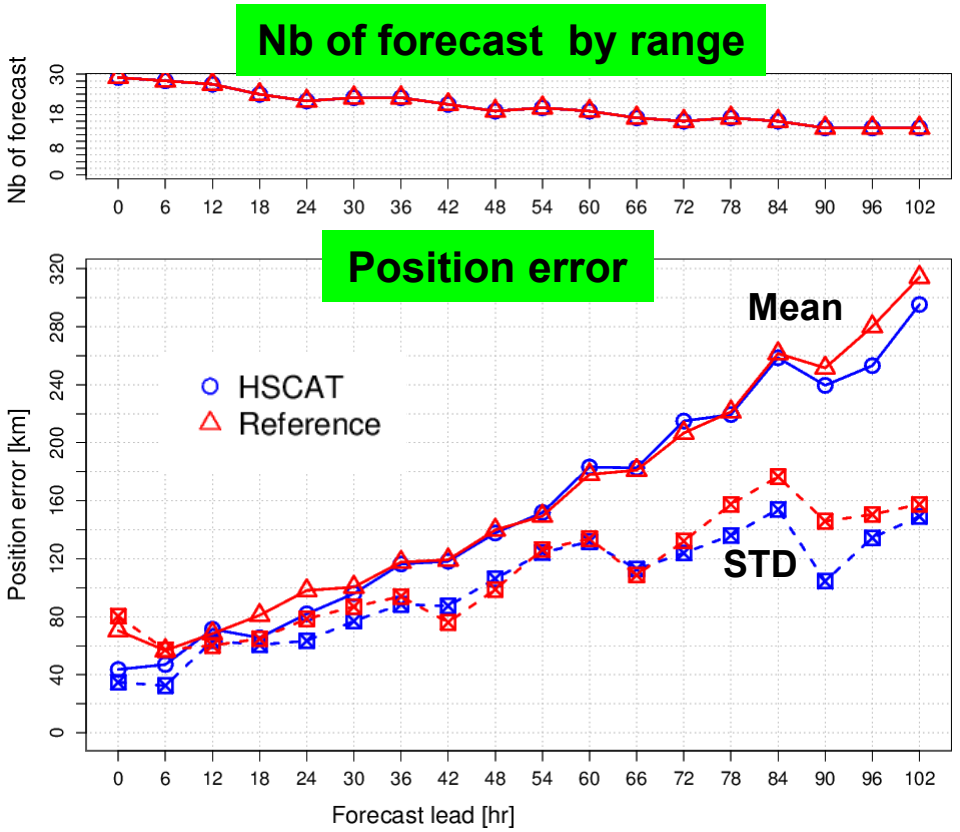
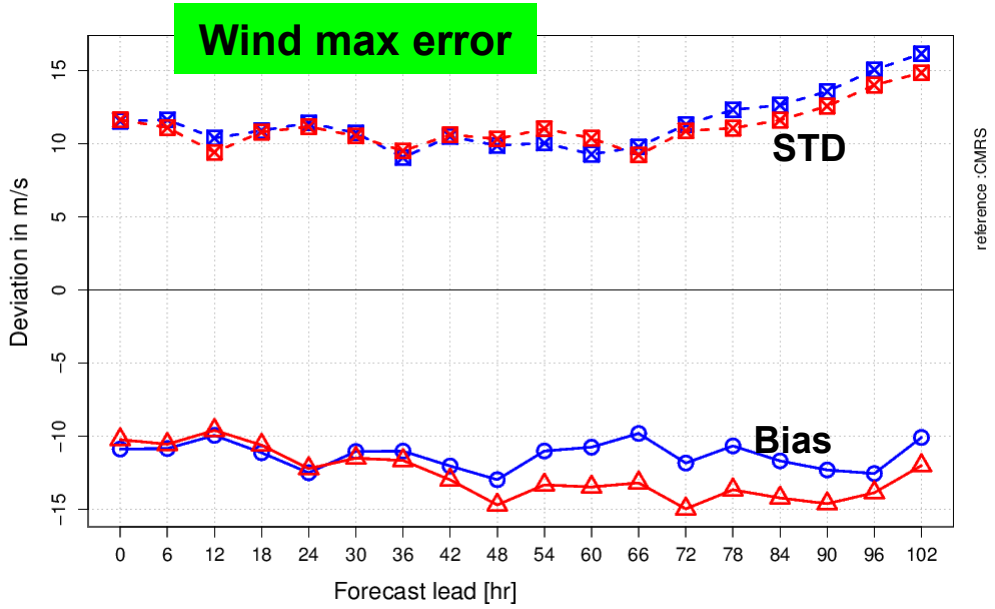


- Position error: light improvement at the end of validity



- Wind max error: prominent improvement of biases.

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Conclusions

- Only the ASCAT winds are used operationally currently
- Scatterometer winds control the dispersion, over the oceanic surfaces, of the ensemble assimilation used for updating the B-matrix for the deterministic run
- The new wind datasets from RapidSCAT and HSCAT have a good quality, similar to ASCAT or OSCAT winds, even a bit better
- These new winds improve the tracking of tropical cyclones. The global scores are more mixed. RapidSCAT winds might be used in our next operational configuration (for the end of the year?), depending on the results of the current work
- Adequate timeliness remains required for HSCAT on HY-2A