

On the impact of Scatterometer winds in Coupled and Uncoupled DAS: preliminary results

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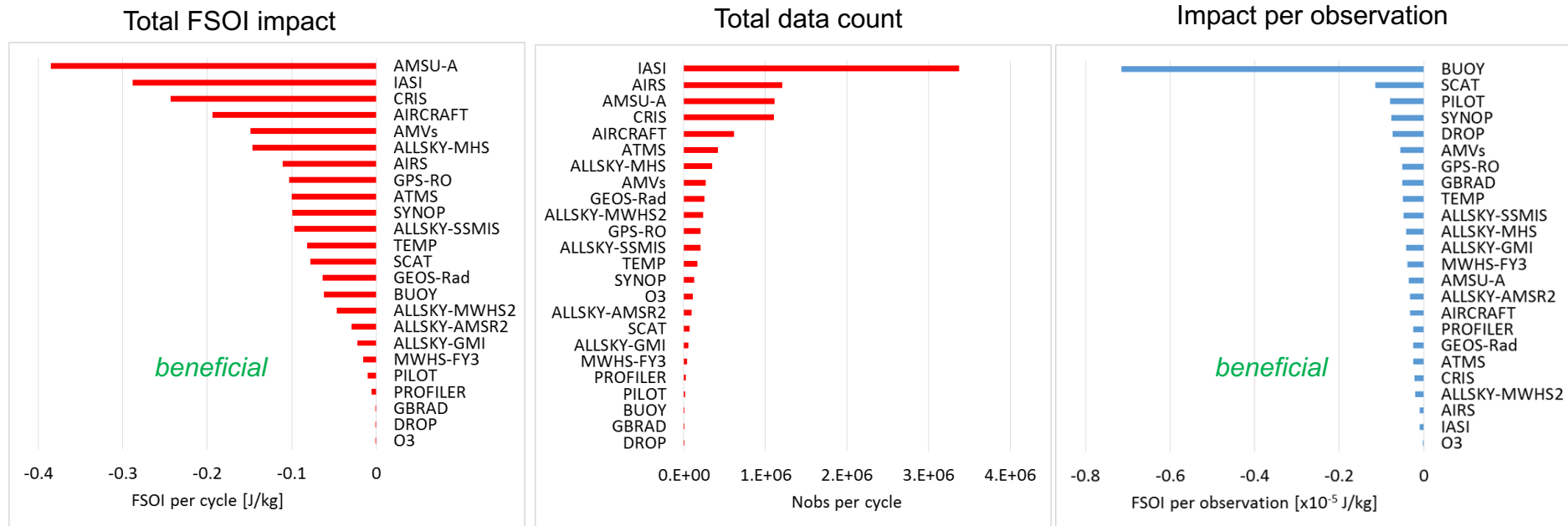
ECMWF - Earth System Assimilation Section

Acknowledgements:

Cristina Lupu, Jean Bidlot, Kristian Mogesen, Lars Isaksen, Stephen English

Impact of major observing systems on reducing 24-h forecast errors, May-Sept. 2016

- Measured using a global dry energy norm, surface to model top
- Negative (positive) FSOI indicate that the assimilation of an observation or subset of observations decreased (increased) 24-hour forecast error and will be referred as *beneficial (detrimental)*.*



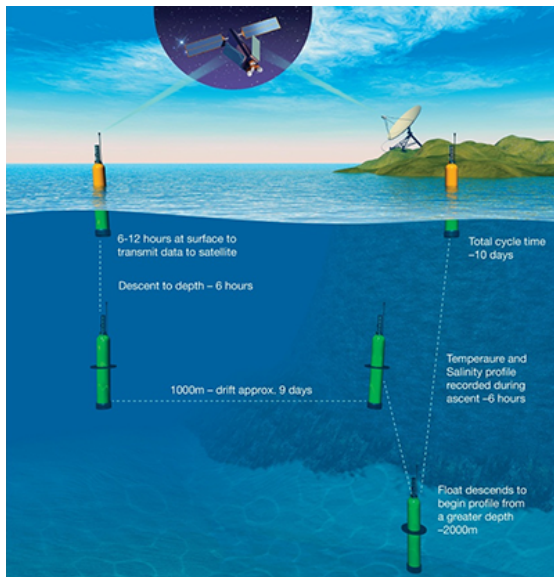
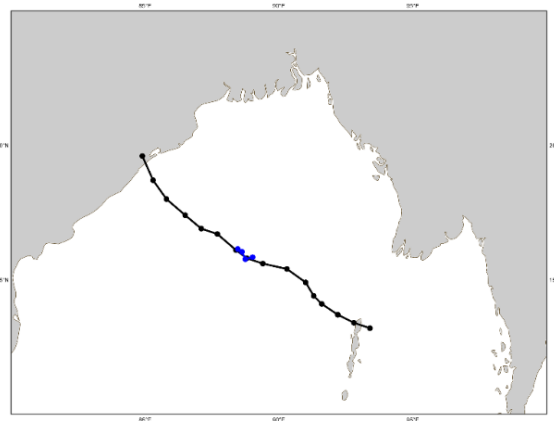
- Observing types with the most significant contributions to error reduction for global NWP: MW sounders (AMSU-A, ATMS), hyper-spectral IR sounders (IASI, CrIS, AIRS), radiosondes, aircraft data and satellite winds (AMVs).
- On a per observation basis, the impact is dominated by buoys, SCAT, radiosondes, AMVs and aircraft observations.

Impact of scatterometer on coupled and uncoupled systems

CERA: Coupled ECMWF Re-Analysis (IFS+Wave+Nemo)

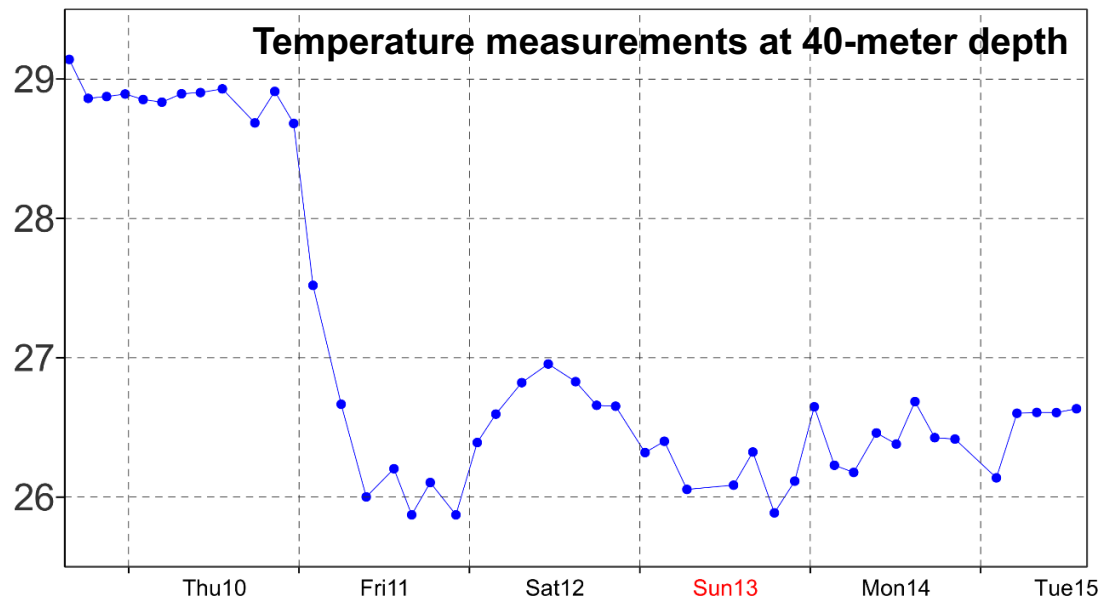
UNCPL: Uncoupled (IFS+Wave+Nemo)

Atmo Model Res ~ 128km / 137L
Ocean Model Res 1 deg/42 L
24h Assimilation Window



Focus on a specific weather event:

- TC Phailin
- Bay of Bengal
- formed on the 4th October 2013
- Argo probe with high-frequency measurements

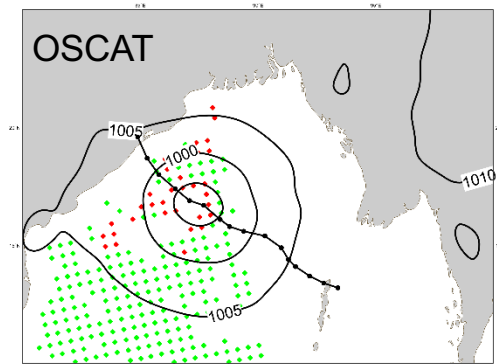
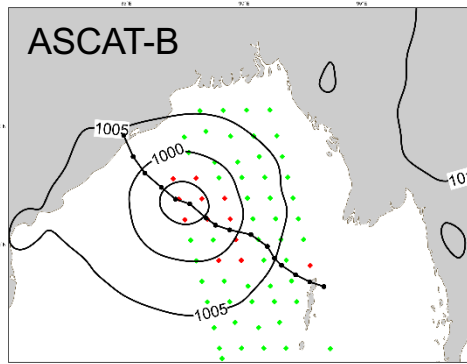
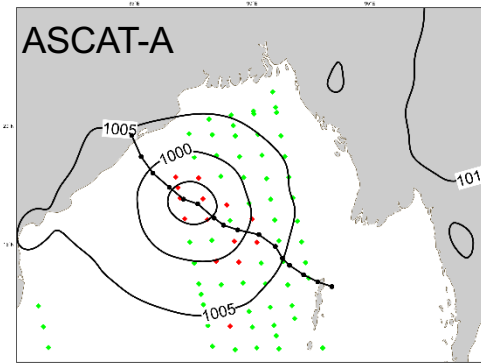


Impact of scatterometer surface wind data in the ECMWF coupled assimilation system
P. Laloyaux, J-N Thépaut and D. Dee. MWR, 2016

Impact on the coupled system

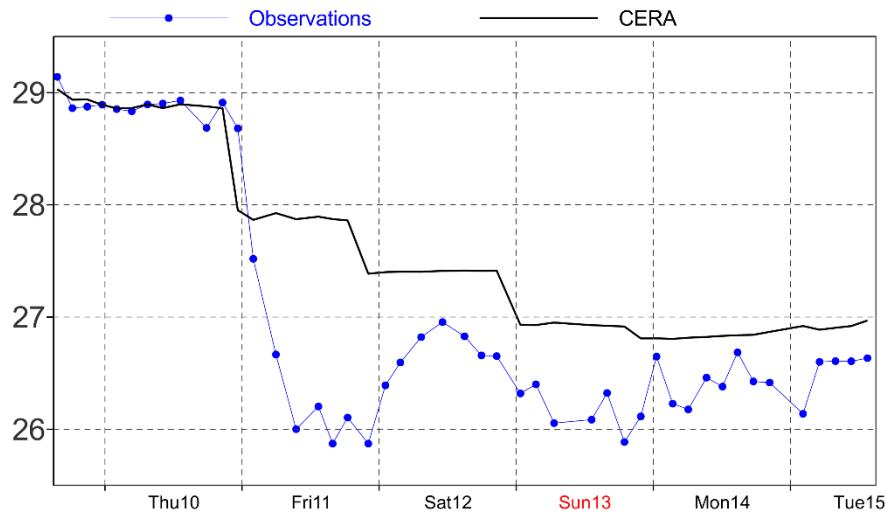
TC Phailin

Wind measurements from scatterometers (ascending pass, 11 October 2013)

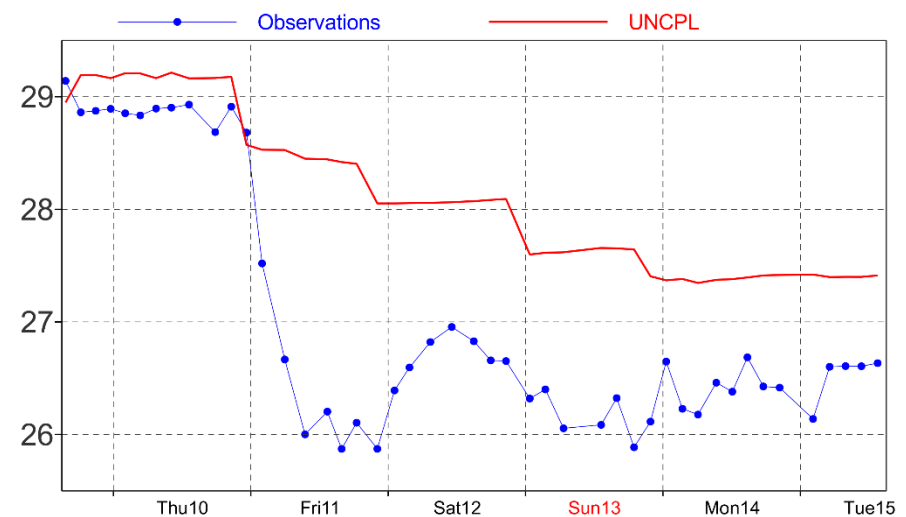


Ocean temperature analysis at 40-meter depth (scatterometer data are assimilated)

CERA



UNCPL

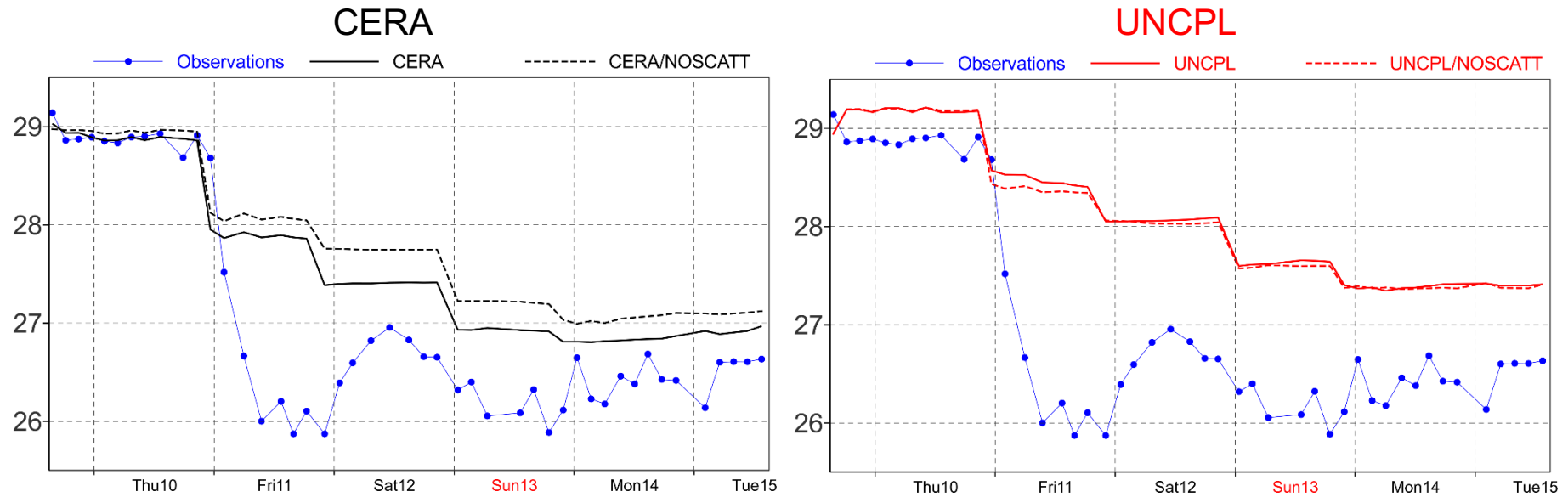


Coupled analysis is closer to the observations with a stronger cold wake

Impact on the coupled system

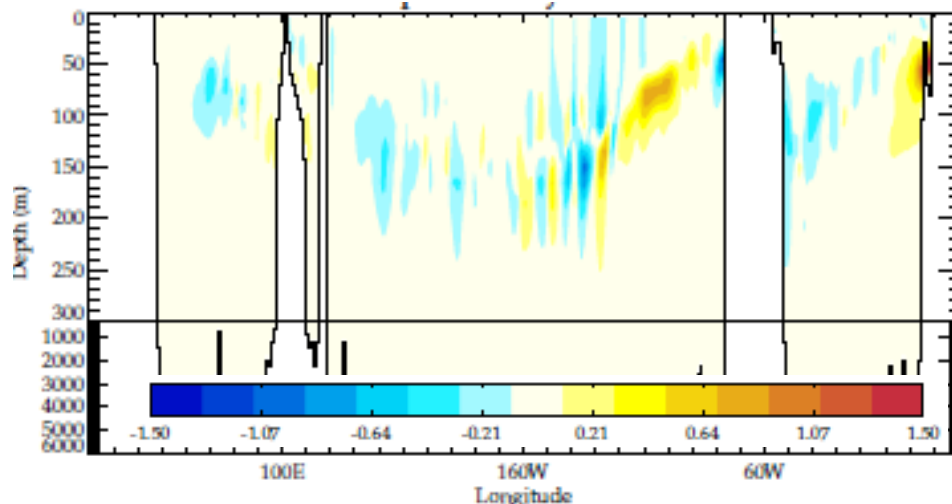
TC Phailin

Ocean temperature analysis at 40-meter depth (no scatterometer data in dashed)



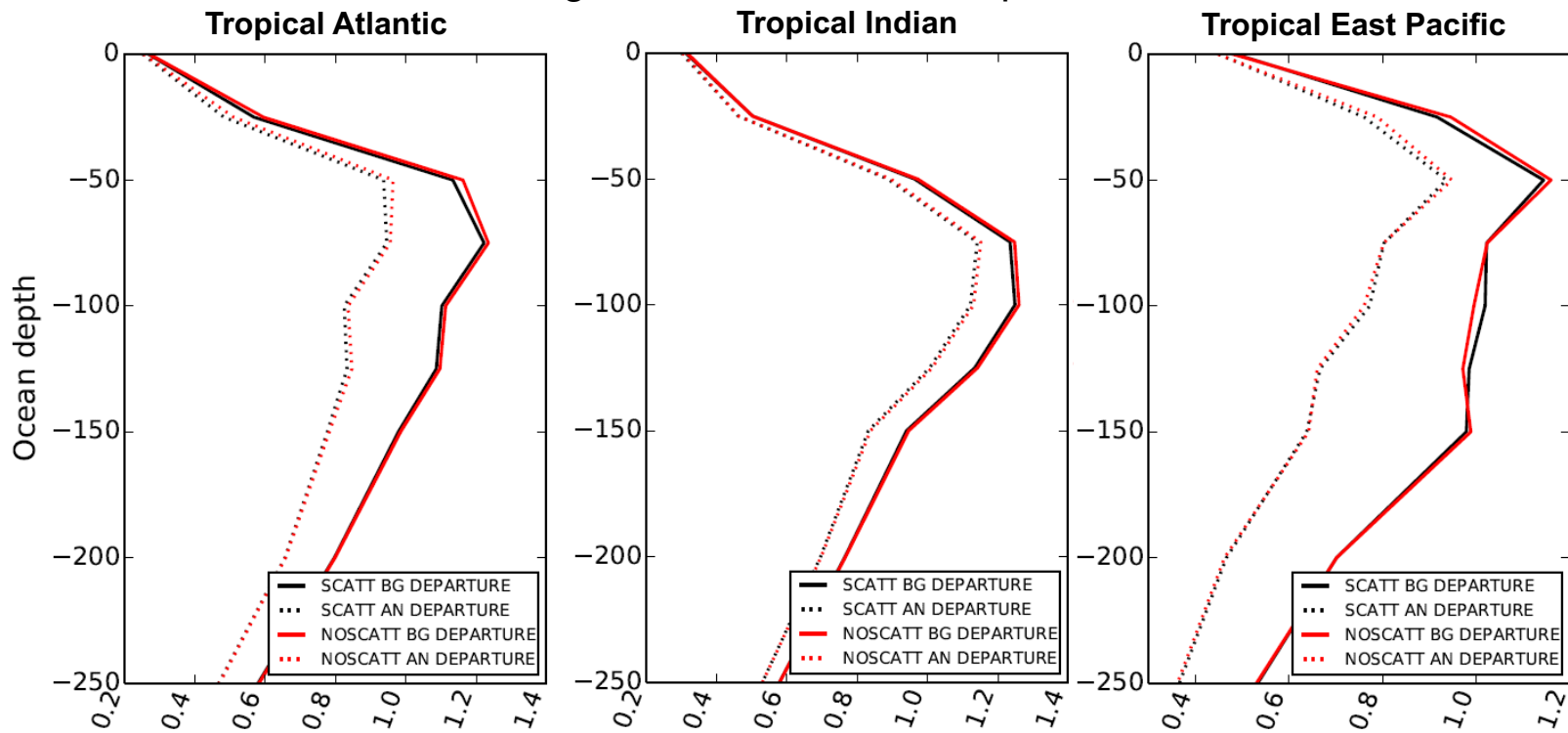
Crucial role of scatterometer data to estimate the ocean state in coupled assimilation
Atmospheric observations have the potential to improve ocean analysis
Fit to observations is not perfect (vertical resolution, nudge to a daily SST product)

Impact on the coupled system



Temperature difference Scatt – NoScatt
November 2013

Verified against conventional temperature observations



Further investigations on going on coupling system

Coupled Atmosphere-Ocean Model OSEs:

- Use of the Coupled ECMWF ReAnalysis (CERA) system at different resolutions
- Experiments running at ~ 60 km / Ocean 0.25 deg
- Tests on higher resolution experiments (32 km / 0.25 deg) ongoing
- Tests using 25km or 12.5km ASCAT A/B products + OSCAT
- Impact on a number of ocean parameters: SST, temperature profiles, SSH, ocean currents
- Verification on TC cases

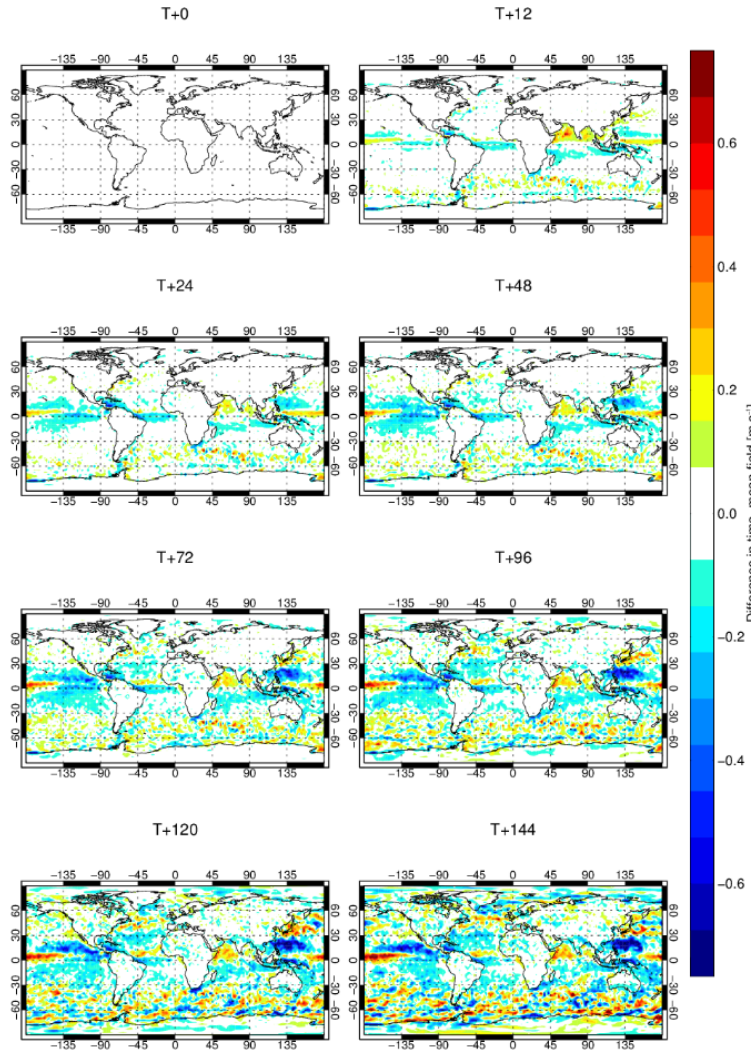
Sensitivity study: coupling vs no coupling to NEMO

IMPACT OF DRAG

U10

Difference in time-mean Z10U (Full Coupling – Uncoupled 43r1)

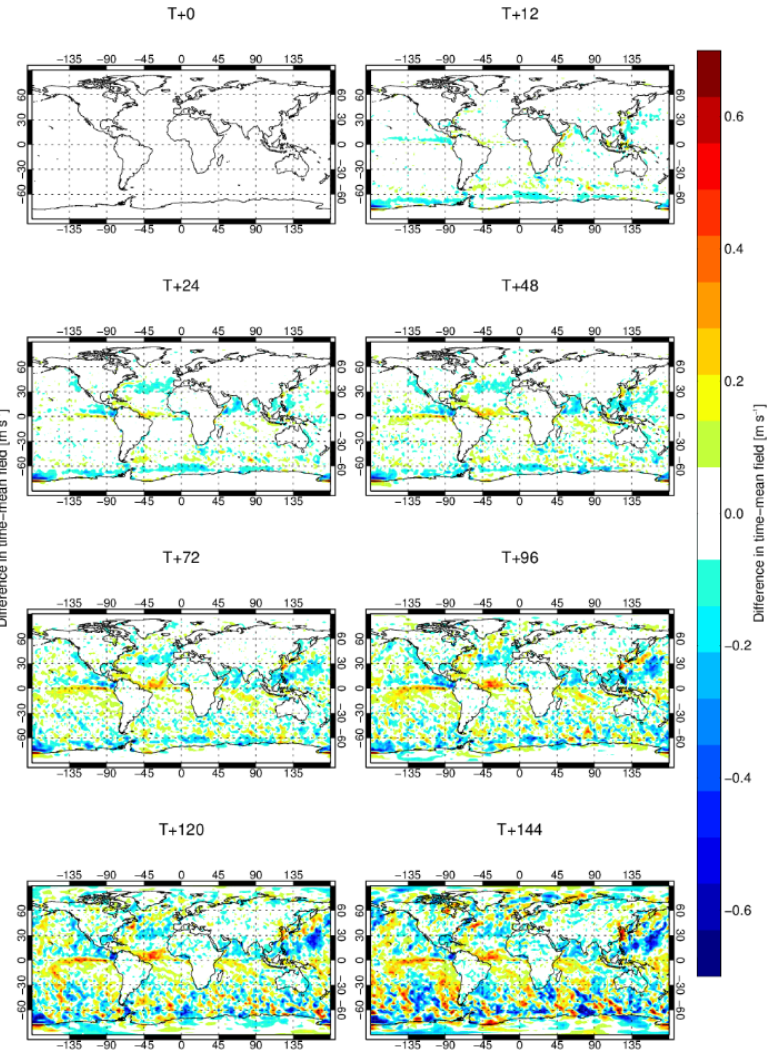
11-Jun-2015 to 31-Aug-2015 from 82 to 82 samples. Verified against 0001.



Difference in time-mean Z10V (Full Coupling – Uncoupled 43r1)

11-Jun-2015 to 31-Aug-2015 from 82 to 82 samples. Verified against 0001.

V10



Conclusions

- ✓ The impact of scatterometer winds in NWP is positive
- ✓ Looking forward to test new datasets
- ✓ Preliminary results on the impact of Scatterometer winds on Ocean parameters and coupled system is promising; extensive analysis ongoing
- ✓ Many areas of investigations to further improve the assimilation: VarQC, wind sampling, ambiguity removal
- ✓ Tests ongoing on the sensitivity to different product resolutions

... more on Marcos' presentation products

- ✓ Testing the sensitivity to different product resolutions:
 - ICM-Barcelona has created super-obbing products (50km/62.5km/100km)
 - Wind speed bias correction has been computed
 - Products include estimation of the ECMWF background error and the ASCAT observation error
 - Tests using L2 winds with/without ICM observation/background error

Product Resolution	Based on	Gridded
12.5 km Coastal	-	-
25 km	-	-
50 km	12.5 km	3x3
62.5 km	12.5 km	4x4
100 km	25 km	3x3