

OSI-SAF METOP-AVHRR PROTOTYPE preliminary results

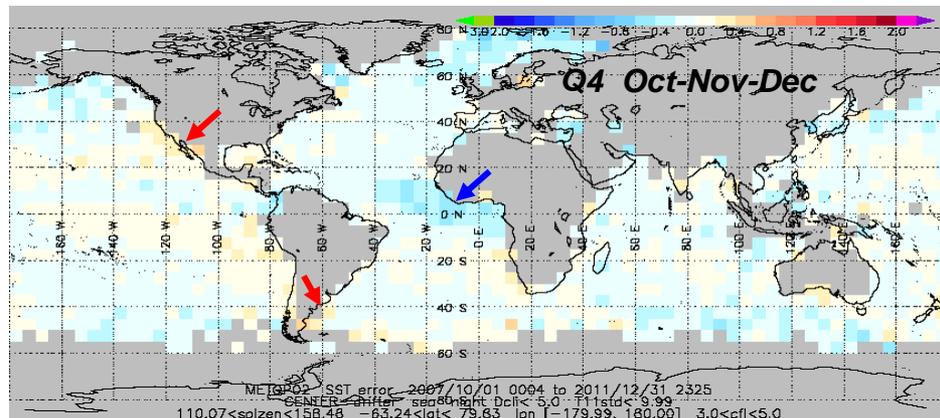
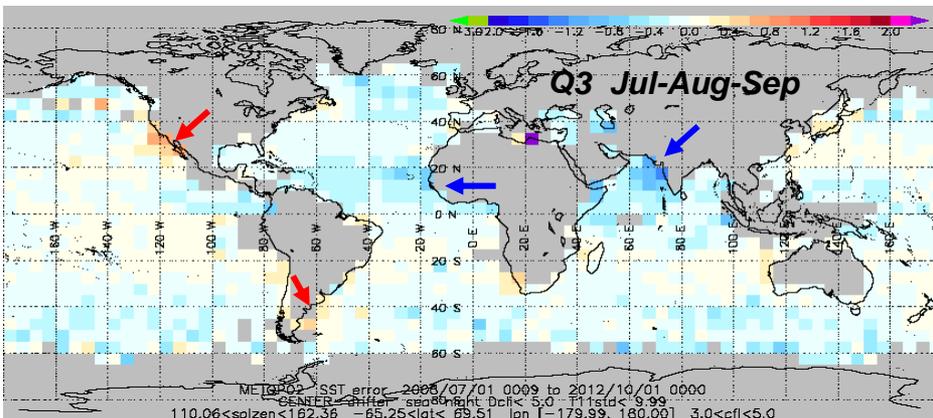
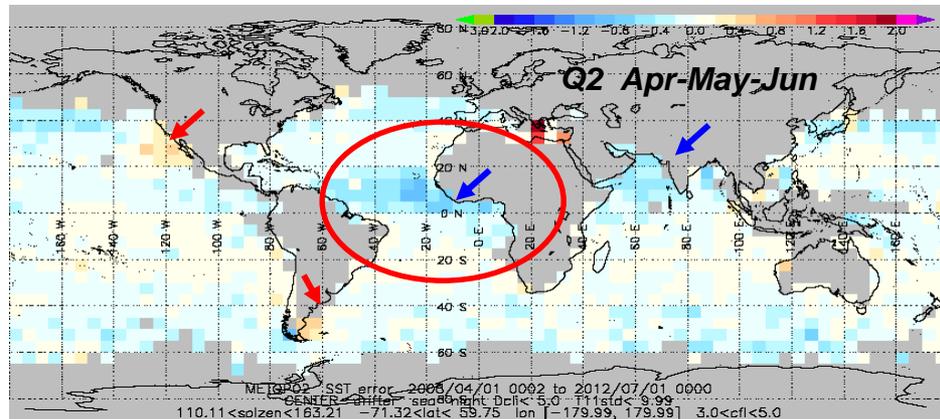
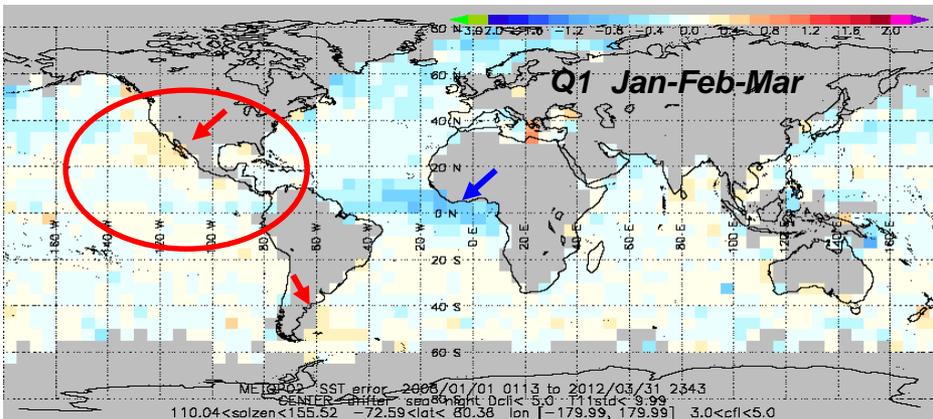
P.LeBorgne, H. Roquet, S. Péré
MF/CMS



OUTLINE

- Introduction and objectives
- BT simulations?
- Prototype results
 - BT simulations
 - SST calculations
- Discussion: the Arctic case
- Conclusions

Introduction (nighttime biases)

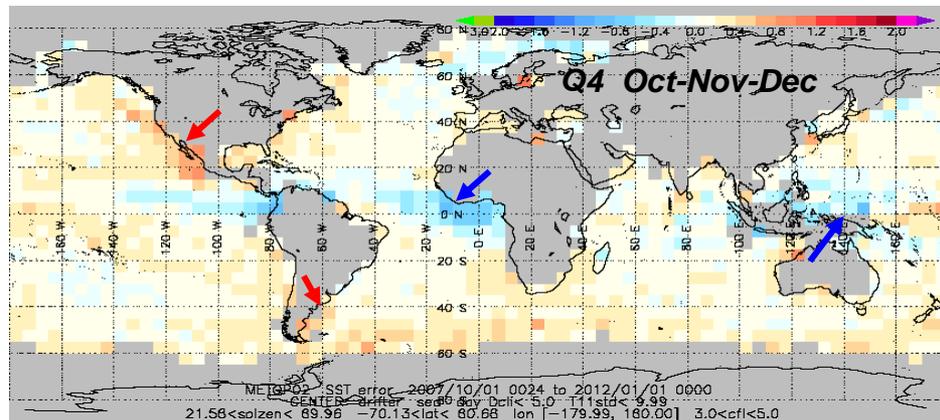
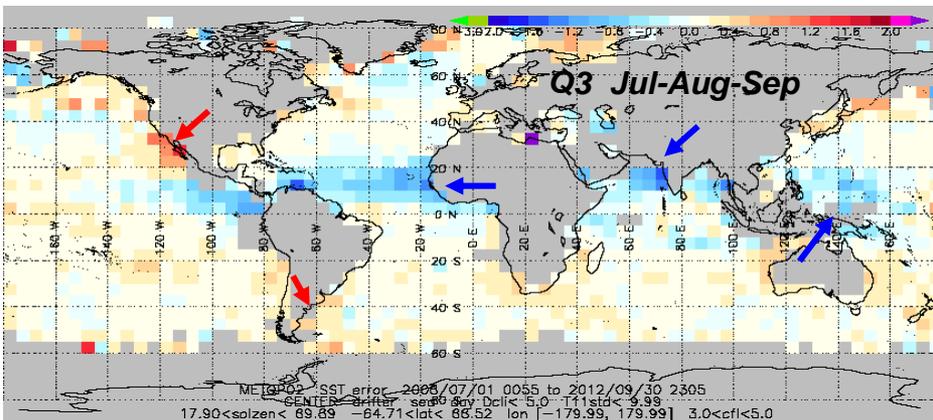
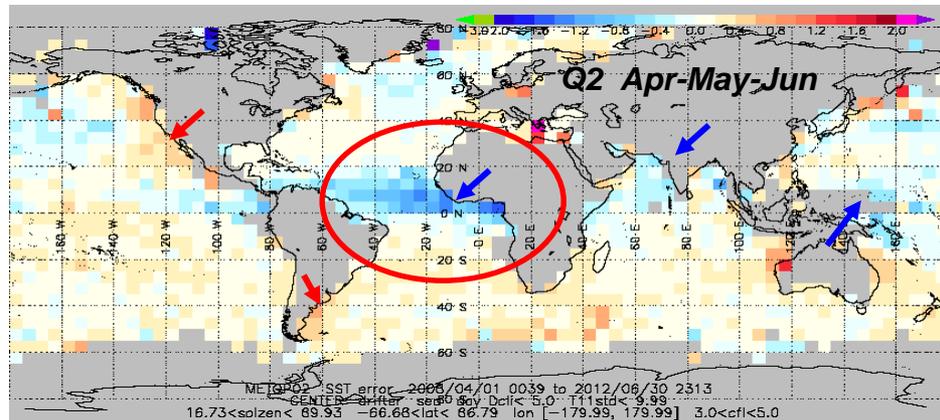
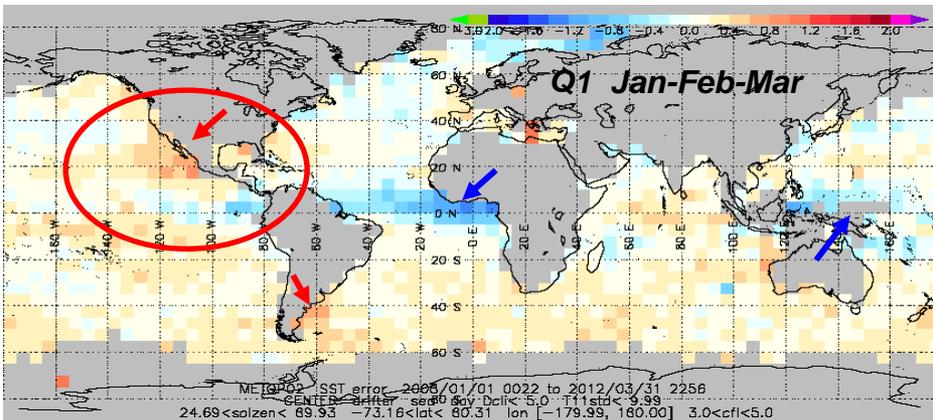


Mean error over 5 years (night)
 GHRSSST XIV, Woodshole 17-
 21 June 2013



METEO FRANCE
 Toujours un temps d'avance

Introduction (daytime biases)



Mean error over 5 years (day)

GHRSSST XIV, Woodshole 17-
21 June 2013



METEO FRANCE
Toujours un temps d'avance

A prototype to correct for regional biases

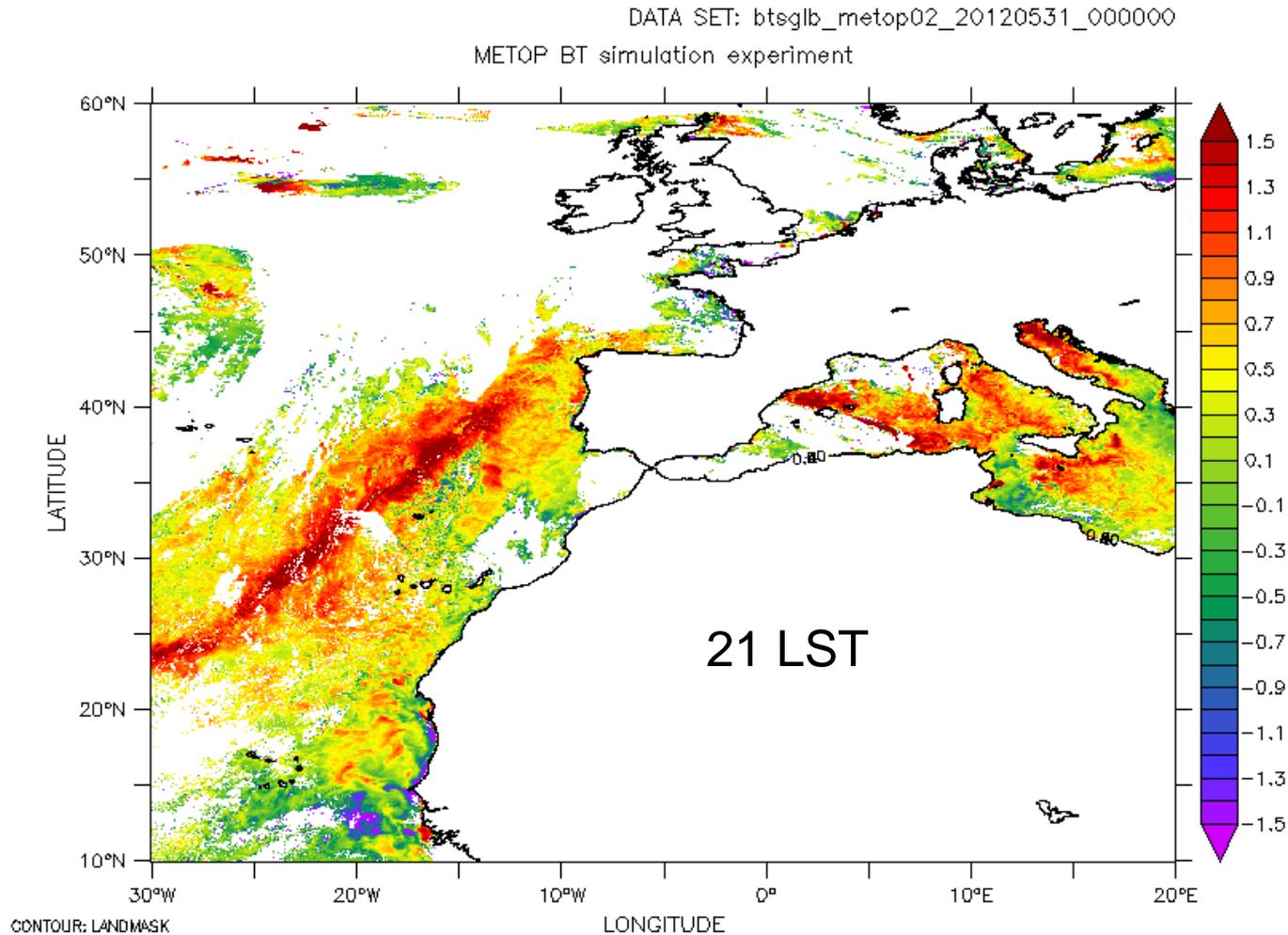
- METOP-A has shown satisfactory results (since 2007)
...but shows regional biases

Accounting for actual atmospheric absorption is needed

- 2 main (BT simulation based) approaches:
 - OE (Merchant et al 2008,2009,2013)
 - Bias correction (LeBorgne et al, 2011, Petrenko et al, 2011)
- $SST = \text{guess} + \sum a_i (\text{obs}BT_i - \text{sim}BT_i)$

A prototype has been run on METOP-A since November 2011 to test a bias correction method similar to that used for GEO satellites (based on BT simulations)

Guess differences (nighttime DW!)



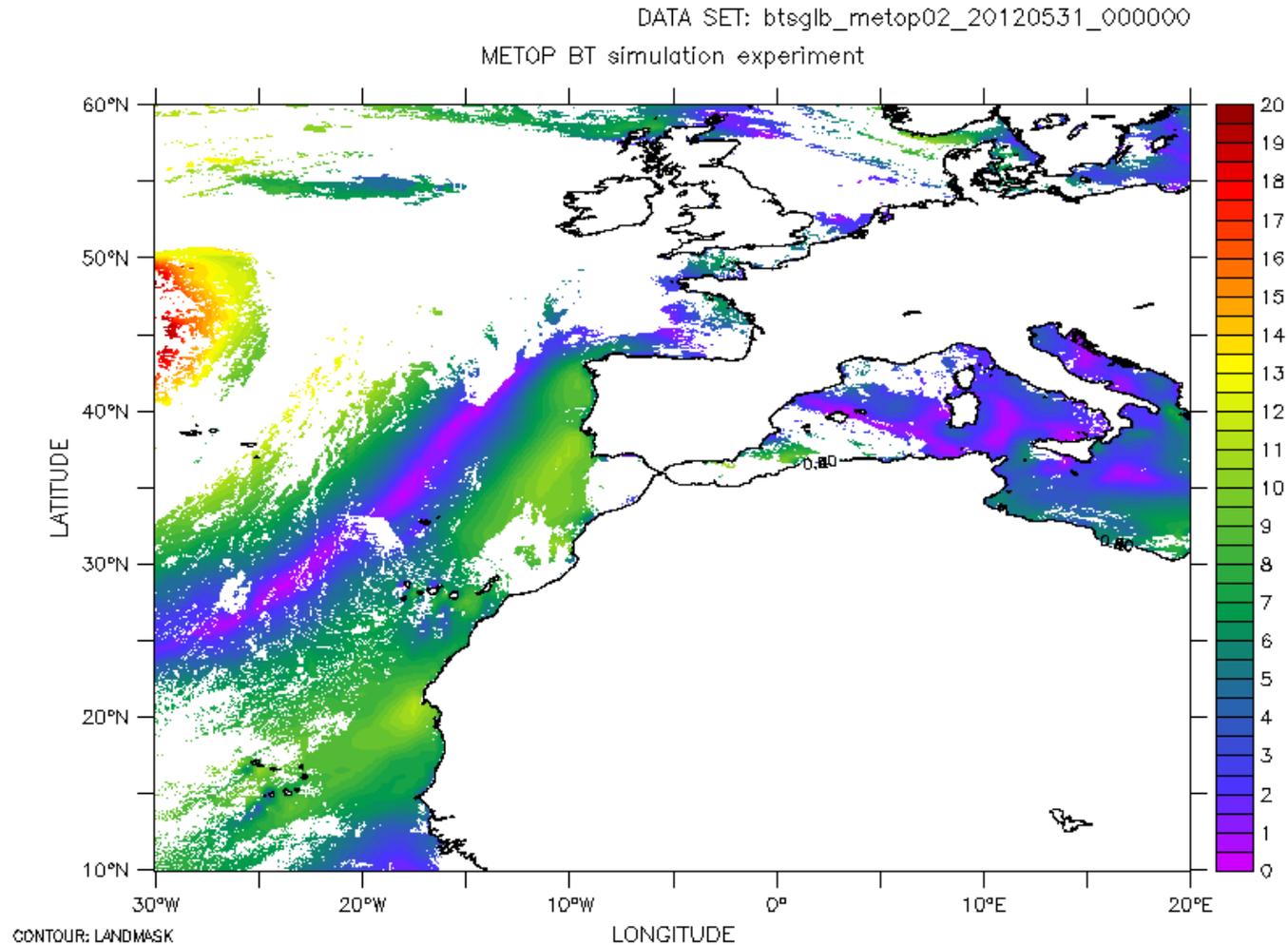
OBST37-SIMUT37

GRISST AV, WOODSHOLE 17-
21 June 2013



METEO FRANCE
Toujours un temps d'avance

Guess differences (nighttime DW!)



model wind (m/s)

GRISST AV, WOODSHOLE 17-
21 June 2013



MÉTÉO FRANCE
Toujours un temps d'avance

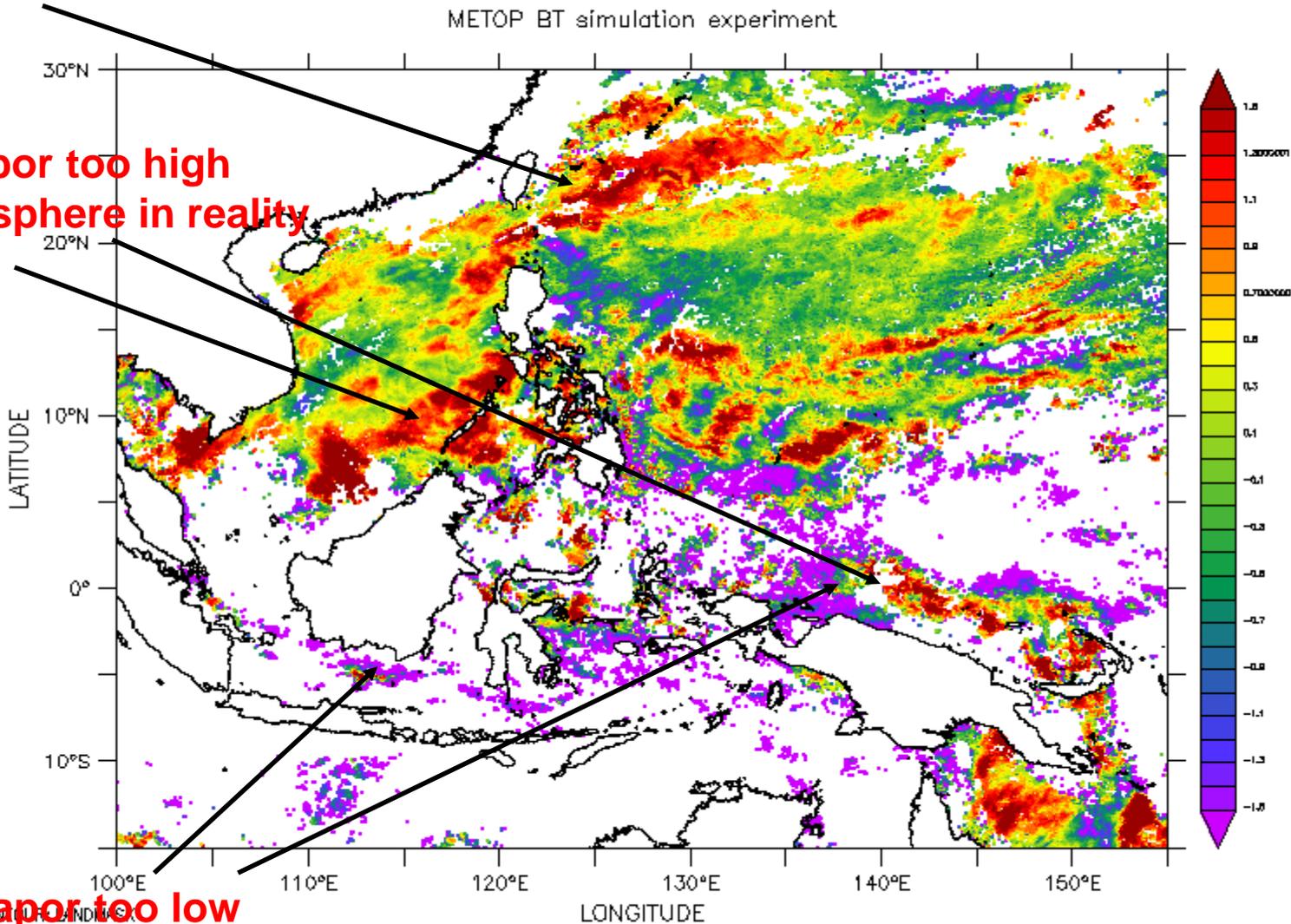
Profile differences

FERRET Ver. 5.61
NOAA/PWEL TMFP
Jan 16 2013 13:24:33

Clouds in ECMWF profiles

DATA SET: btsglb_metop02_20120301_120000

METOP BT simulation experiment



Model vapor too high
Dry atmosphere in reality

Model vapor too low
Humid halo around clouds

OBST108-SIMUT108

21 June 2013

BT adjustment

- Analytic solution not convincing
- Daily adjustment maps have been defined (same approach as for operational geostationary processing)
- Built from filtered simulation- observation differences averaged...
- over 10 days and 10° (lat lon)
- BT adjustment in **strictly nighttime conditions** ($\theta_{\text{sol}} > 110^\circ$)

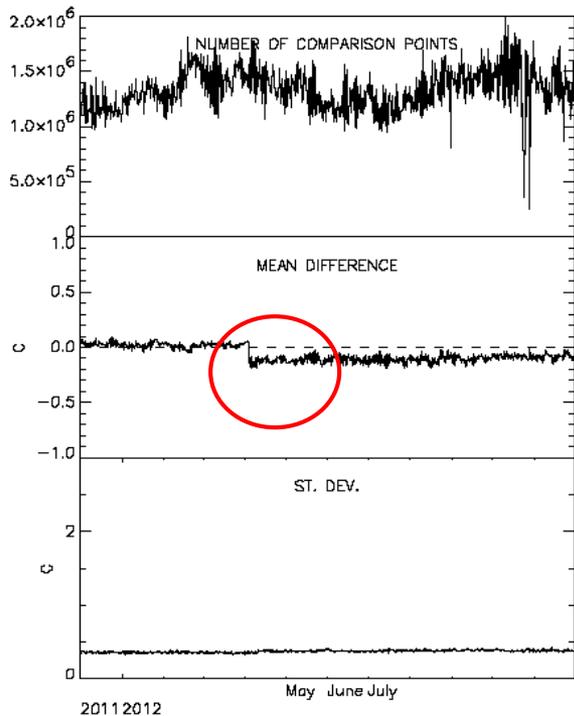
ARCTIC?

BT simulations-observations

T37

t37: simulations-observations

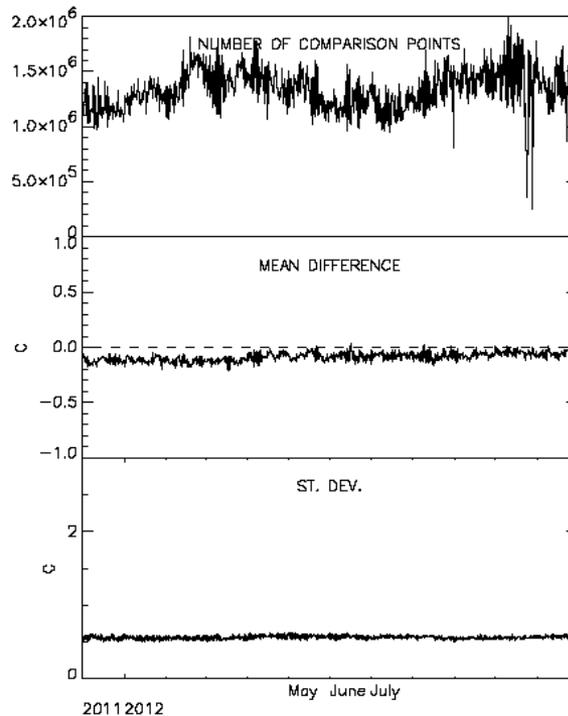
Overall mean T37 difference= -0.06 C



T108

t108: simulations-observations

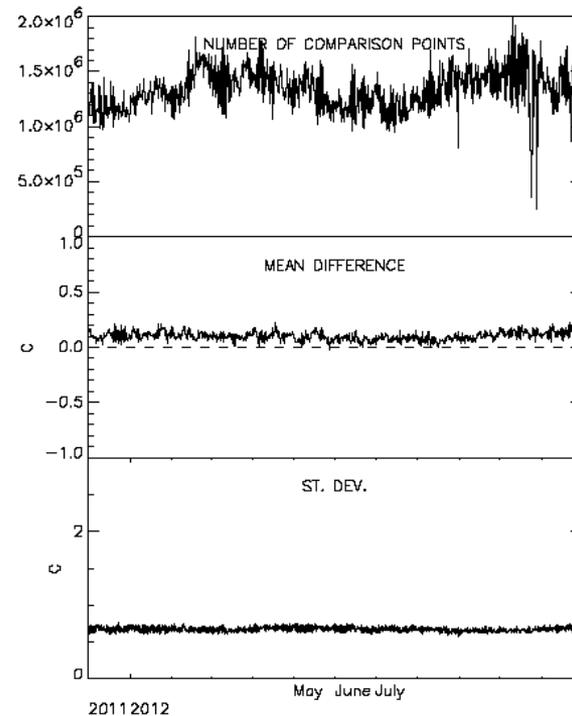
Overall mean T108 difference= -0.09 C



T120

t120: simulations-observations

Overall mean T120 difference= 0.10 C



« cloud free » cases:

qual. levels > 3; $|\text{simBT108-obsBT108}| < 1.5\text{K}$; wind > 2ms-1

BT adjusted simulations-observations

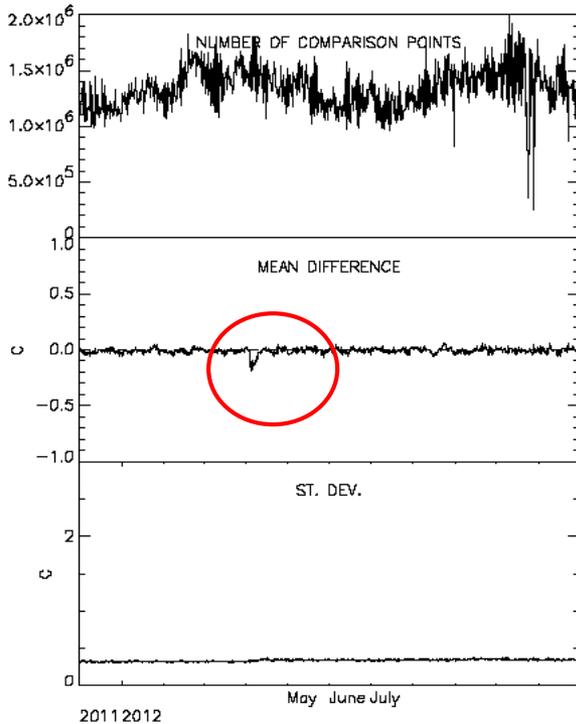
T37

T108

T120

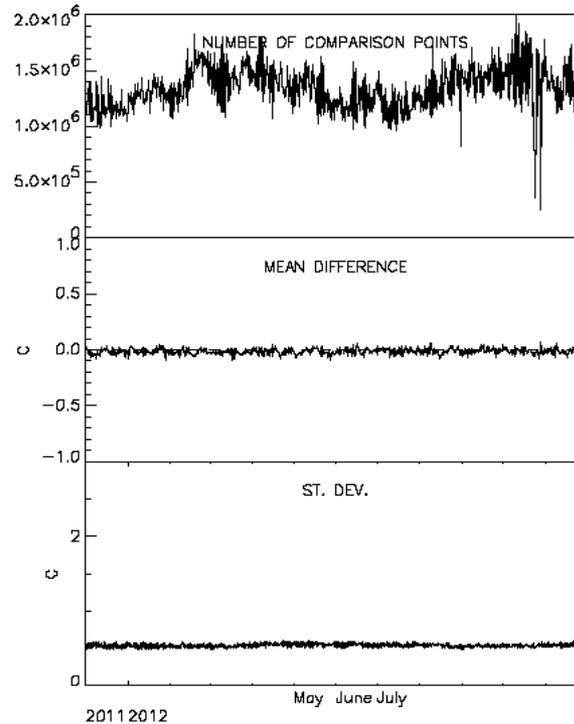
t37: adj. simulations-observations

Overall mean adj. T37 difference= -0.01 C



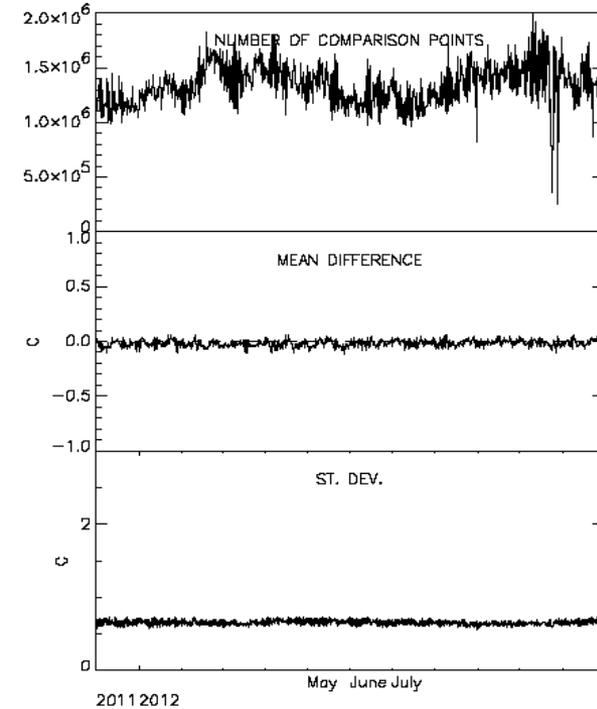
t108: adj. simulations-observations

Overall mean adj. T108 difference= -0.02 C



t120: adj. simulations-observations

Overall mean adj. T120 difference= -0.02 C

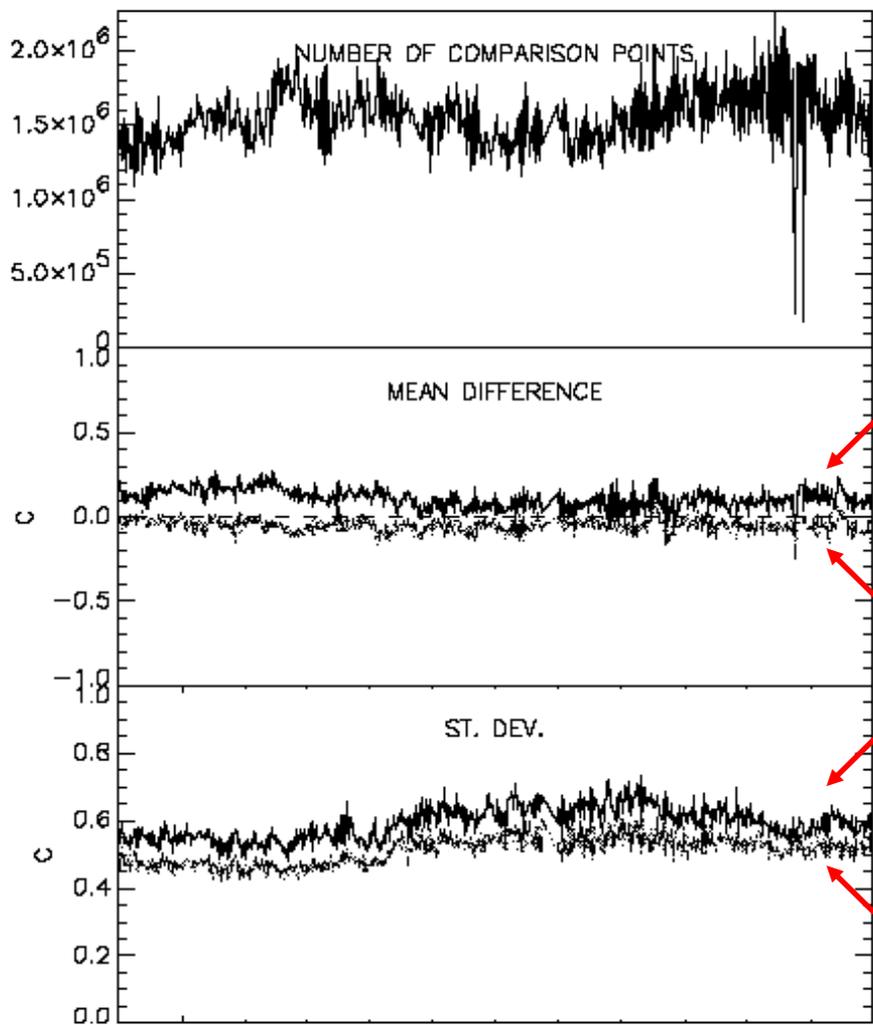


- Good results on the average
- Not optimal according to Tomazic et al 2013: 3 days , 15°

SST corrections: comparison to OSTIA

resultats_nl

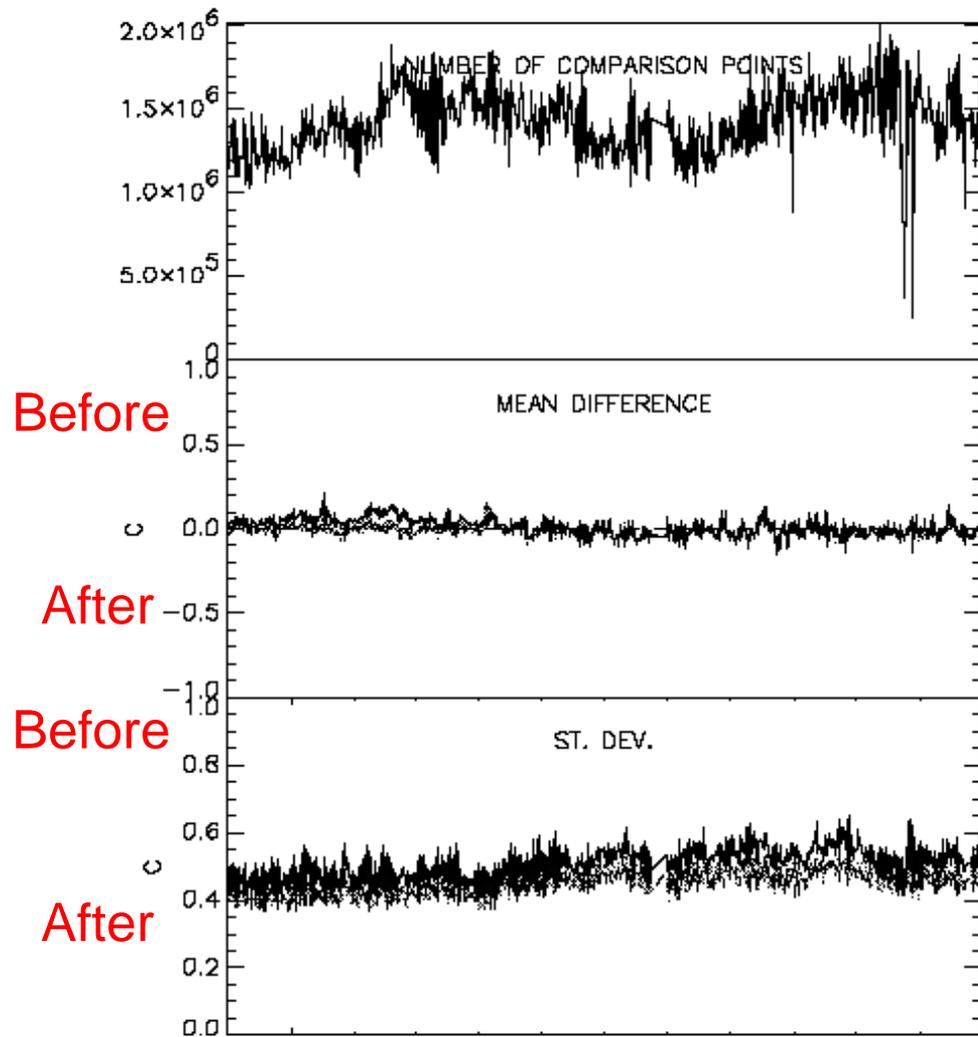
Mean nl SST difference= 0.11 C; corrected = -0.05 C



Daytime

resultats_37

Mean 37 SST difference= 0.01 C; corrected = -0.01 C



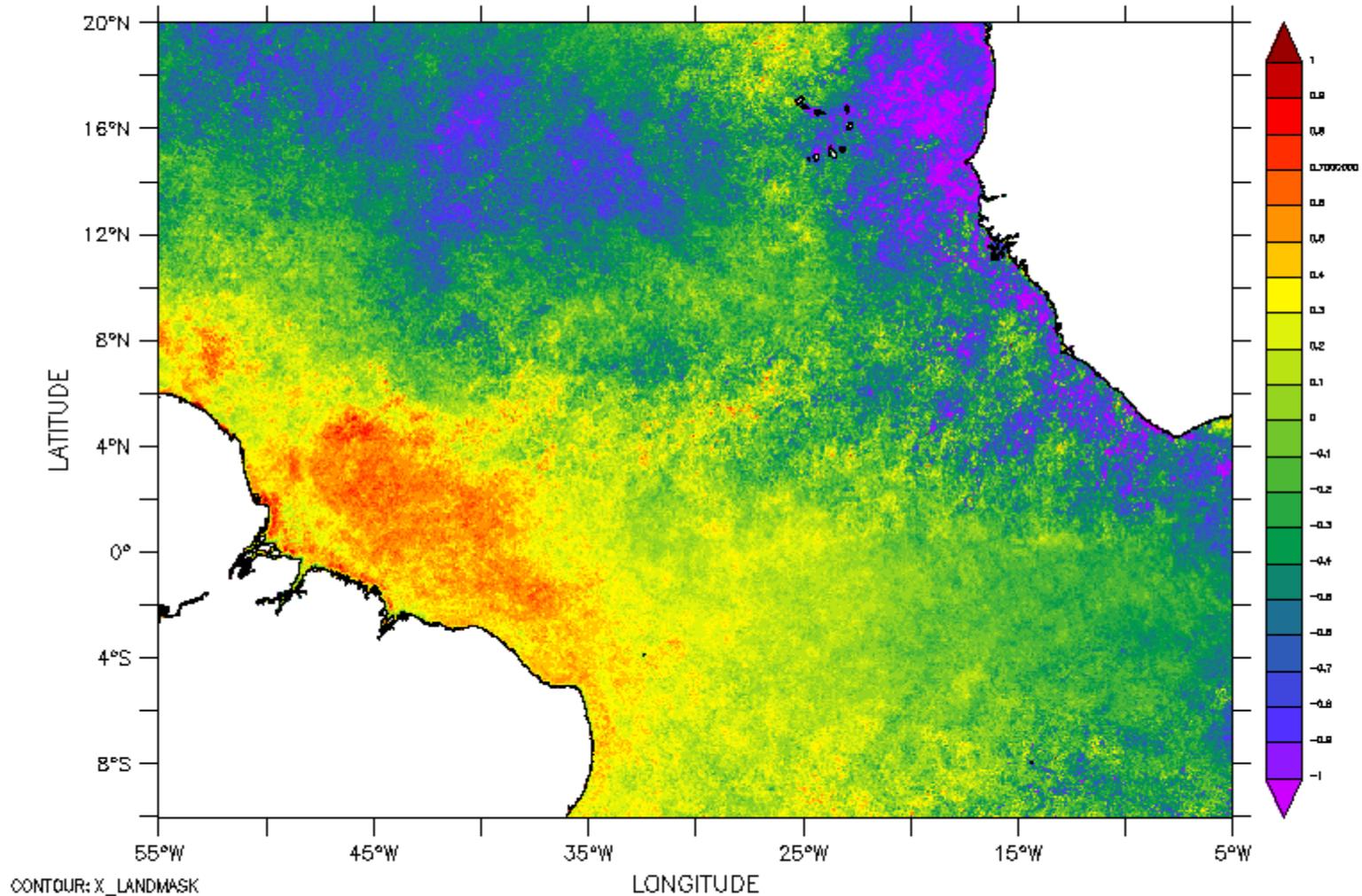
Nighttime

13

Daytime mean observed difference to OSTIA

DATA SET: avg_sig_over_30_sstglb_metop02_20120930_day
METOP BT simulation experiment

FERRET Ver. 5.61
NOAA/PWEL TRMP
Sep 13 2013 10:35:21

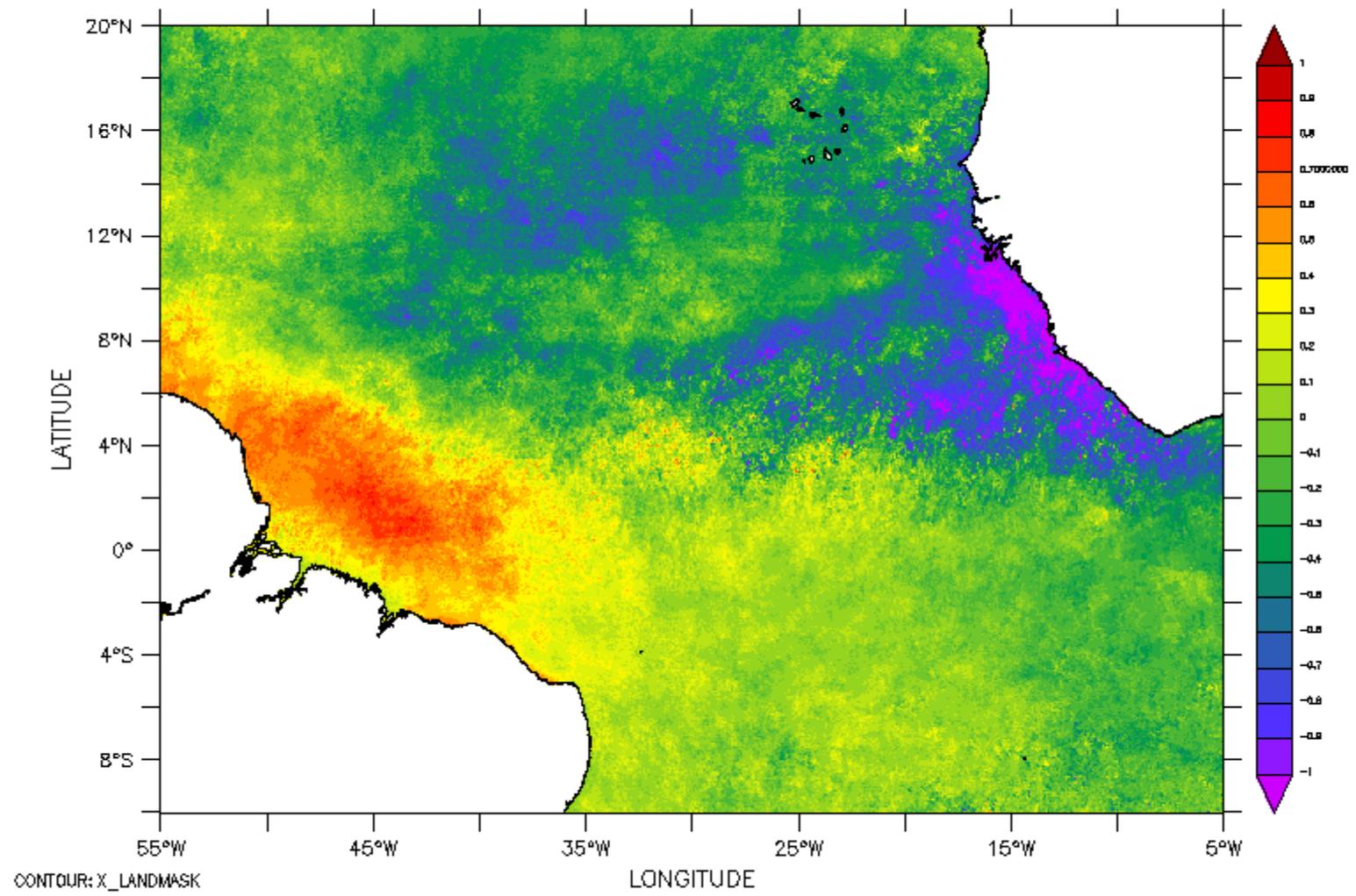


21 June 2013

FERRET Ver. 5.61
NOAA/PWEL TRMP
Sep 13 2013 10:36:28

Daytime mean predicted difference to OSTIA

DATA SET: avg_sig_over_30_sstglb_metop02_20120930_day
METOP BT simulation experiment



CONTOUR: X_LANDMASK

-1*AVG_CORSSST

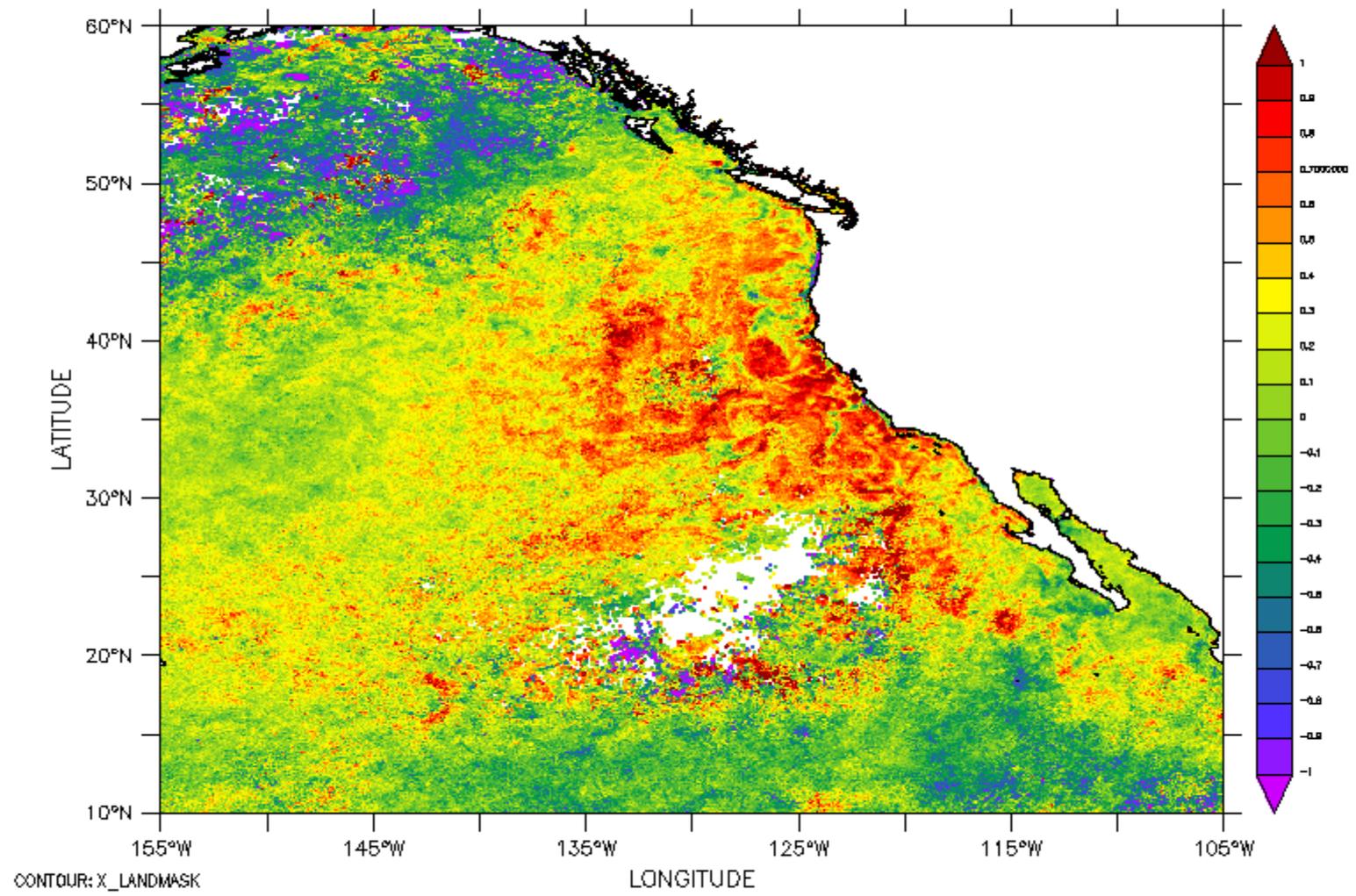
SEPTEMBER

21 June 2013

FERRET Ver. 5.61
NOAA/PWEL TRAP
on 12/2013 10:31:03

Nighttime mean observed difference to OSTIA

DATA SET: avg_sig_over_30_sstglb_metop02_20120930_purenig
METOP BT simulation experiment



CONTOUR: X_LANDMASK

errsst (K)

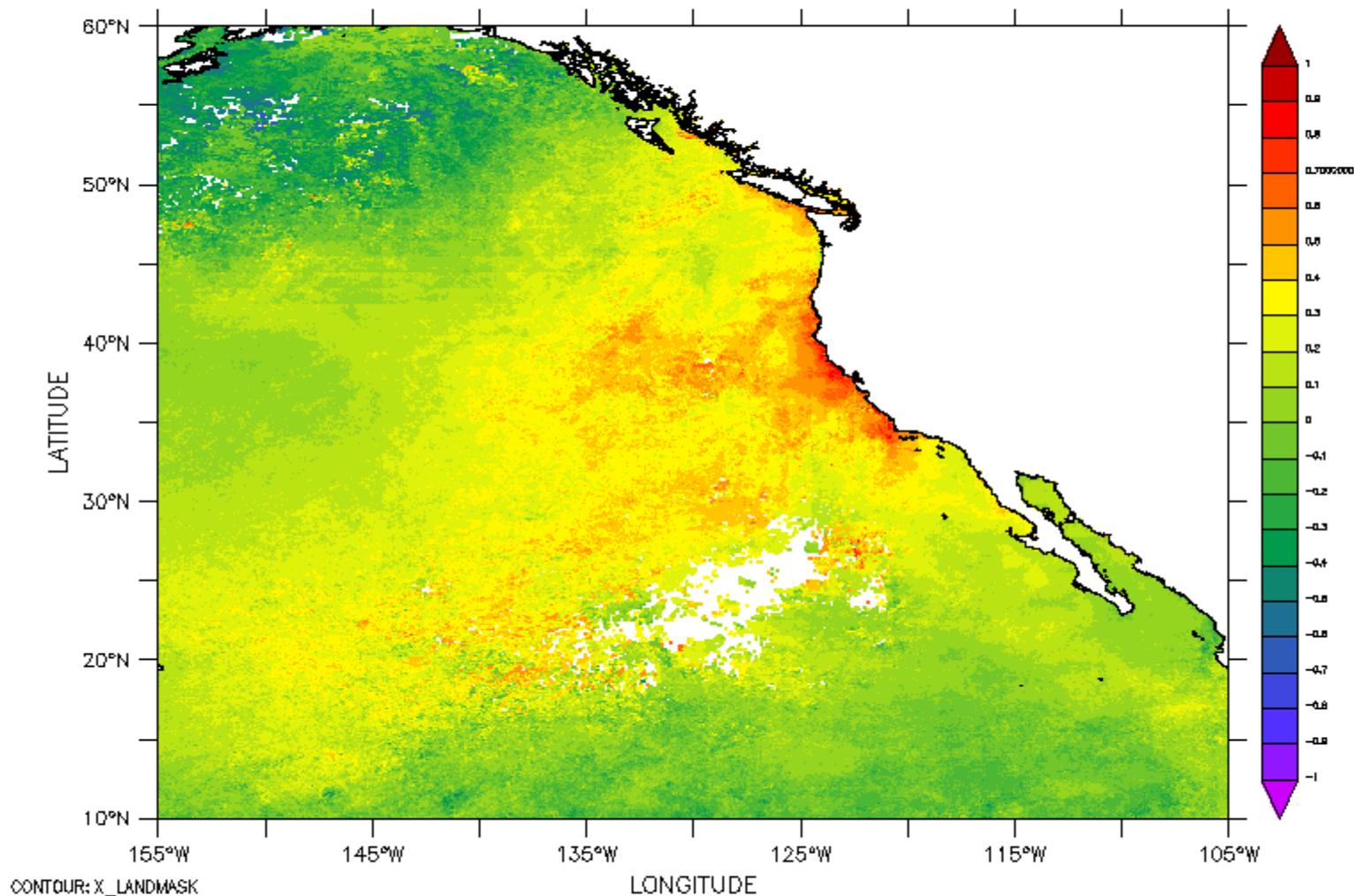
SEPTEMBER

21 June 2013

FERRET Ver. 5.61
 NOAA/PWEL TRMP
 2013/06/21 10:38:32

Nighttime mean predicted difference to OSTIA

DATA SET: avg_sig_over_30_sstglb_metop02_20120930_purenig
 METOP BT simulation experiment



-1*AVG_CORSSST

SEPTEMBER

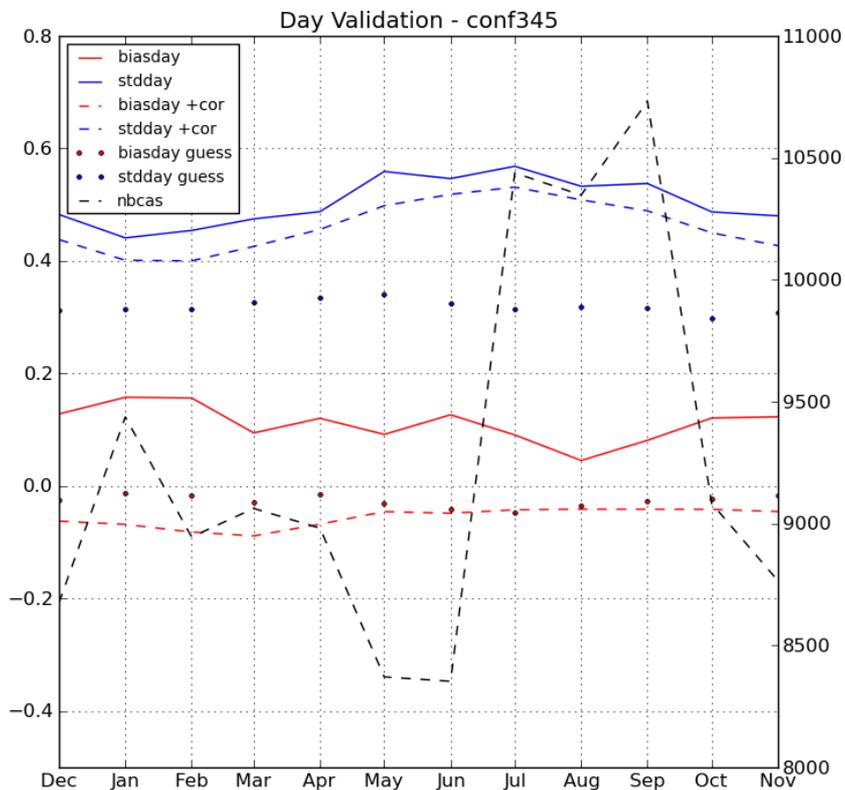
21 June 2013

ANCE

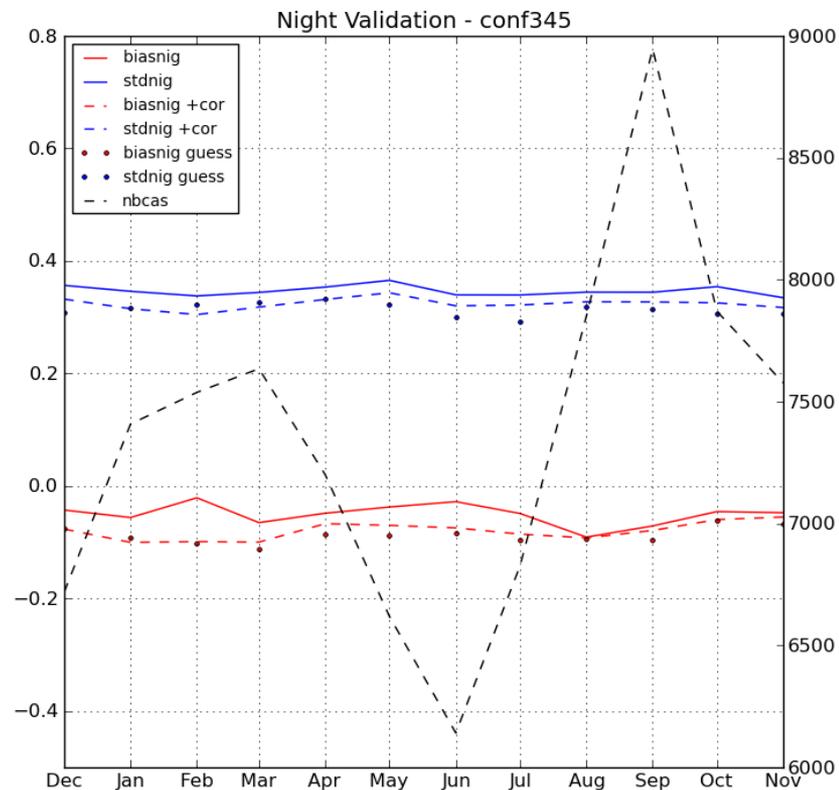
Toujours un temps d'avance

SST corrections: comparison to buoy measurements (qual 3-4-5)

Daytime



Nighttime

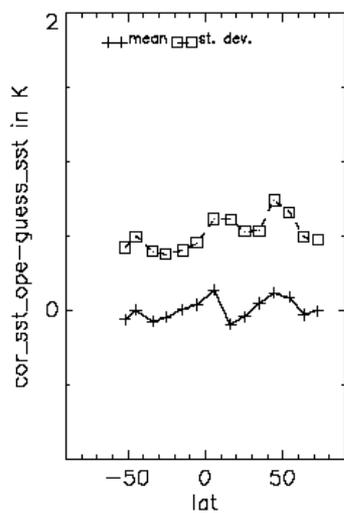


Qual >3; |guess-insitu| < 1.5; obst37 > simu-1.; obst108 > simu-1.5

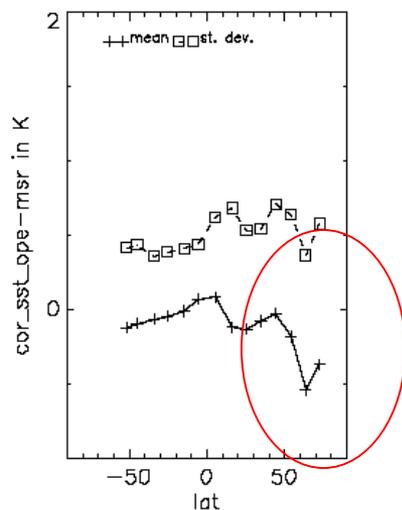
What about HL (Arctic) in daytime?

- Tomazic's optimal parameters 3 days x 15°
- 3.7 μm adjustment as in prototype
- 10.8 and 12.0 μm adjustment: $\theta_{\text{sun}} > 90$ or wind $> 4 \text{ ms}^{-1}$
- Applied in December 2011, March, **June**, September 2012

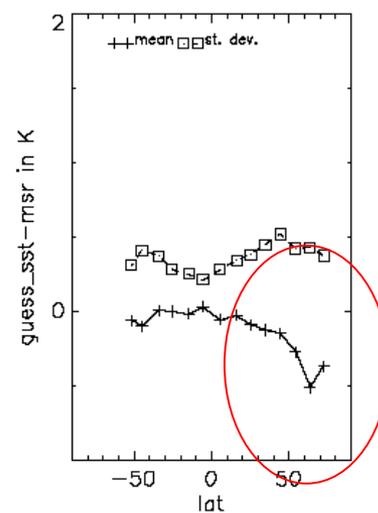
Errors as a function of latitude in June 2012:
VS OSTIA



VS buoys



OSTIA vs buoys

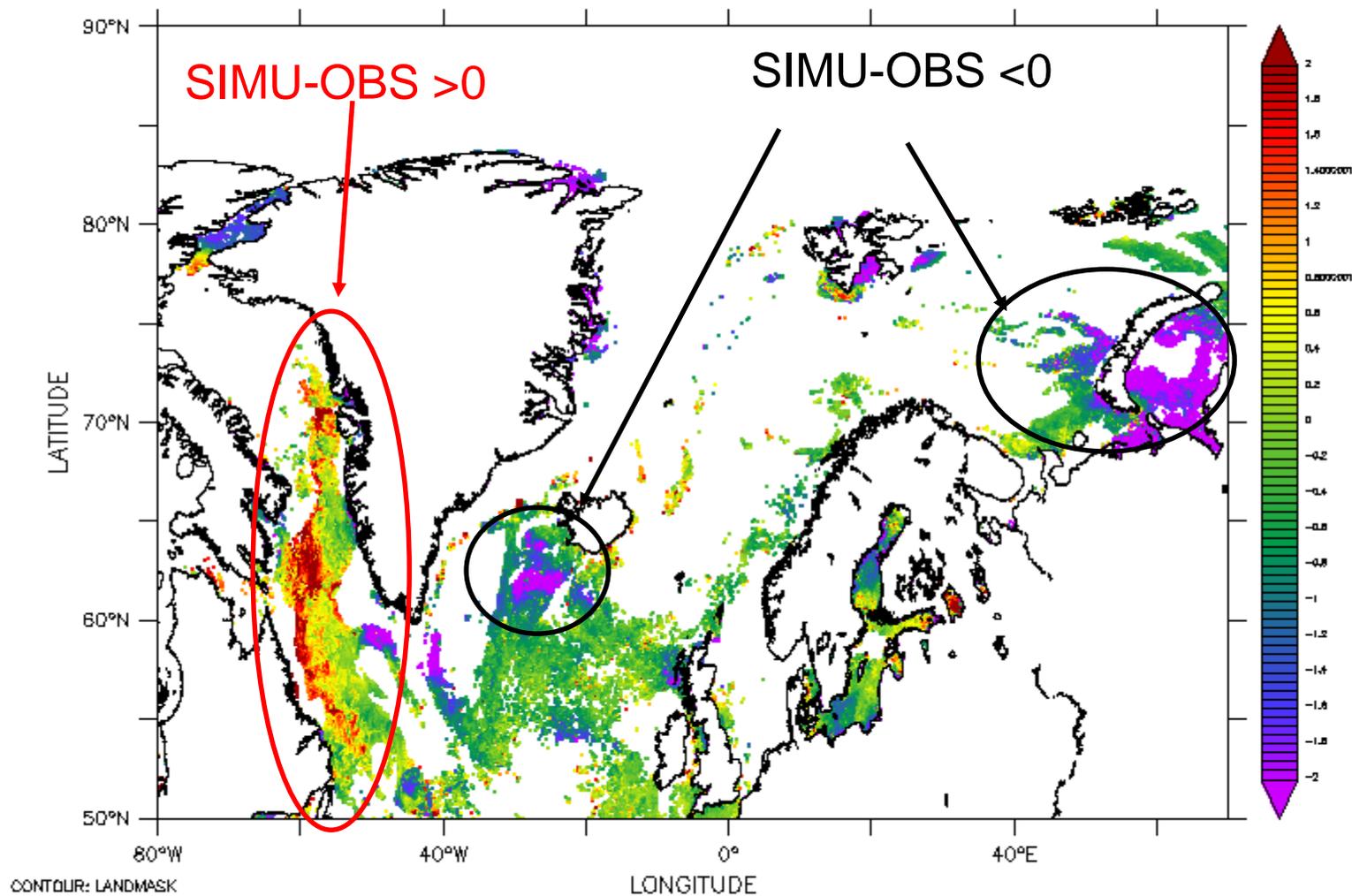


Operational+Correction

Operational+Correction
21 June 2013

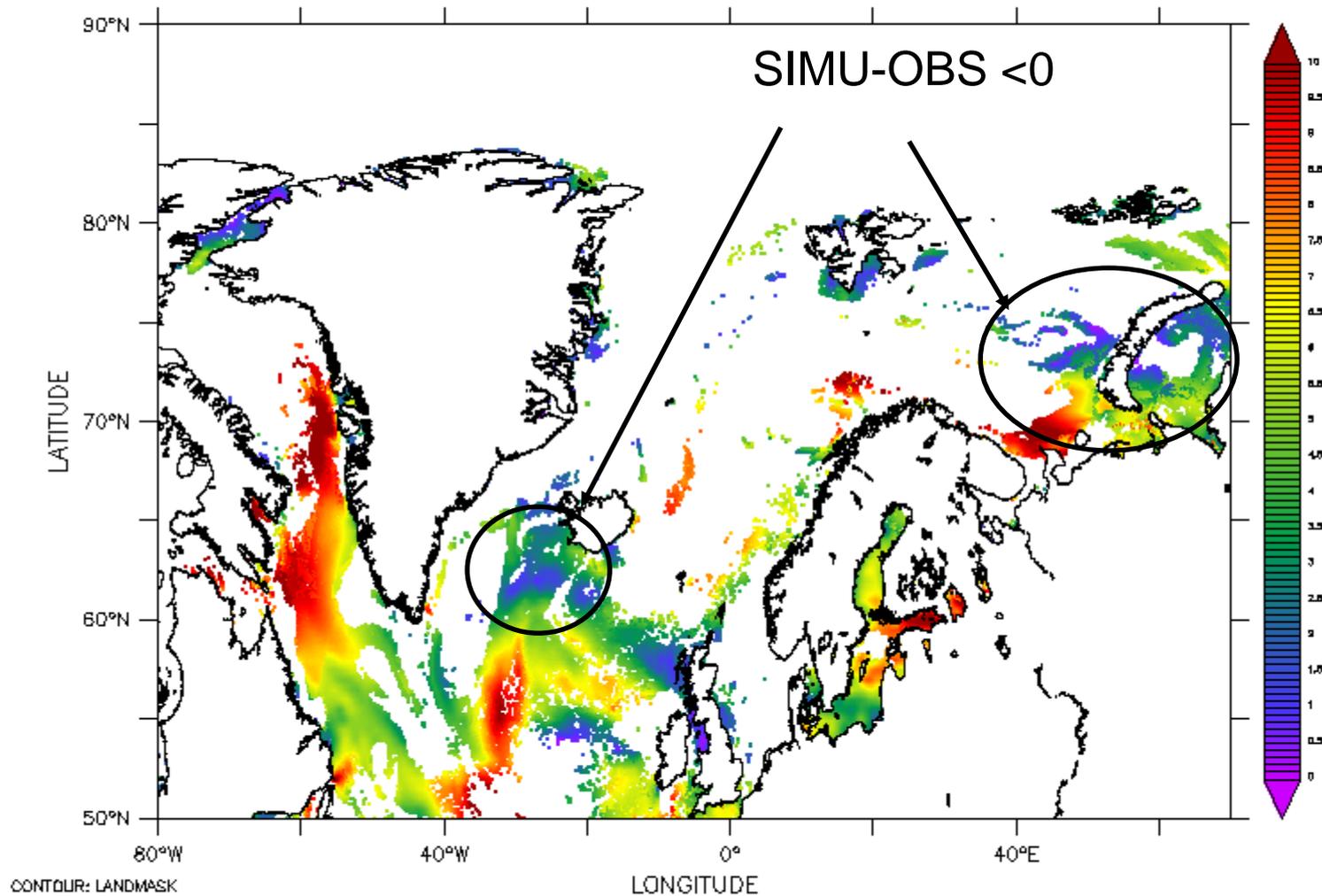


METEO FRANCE
Toujours un temps d'avance

DATA SET: btsglb_metop02_20120618_120000
METOP BT simulation experiment

SIMUT108-OBST108

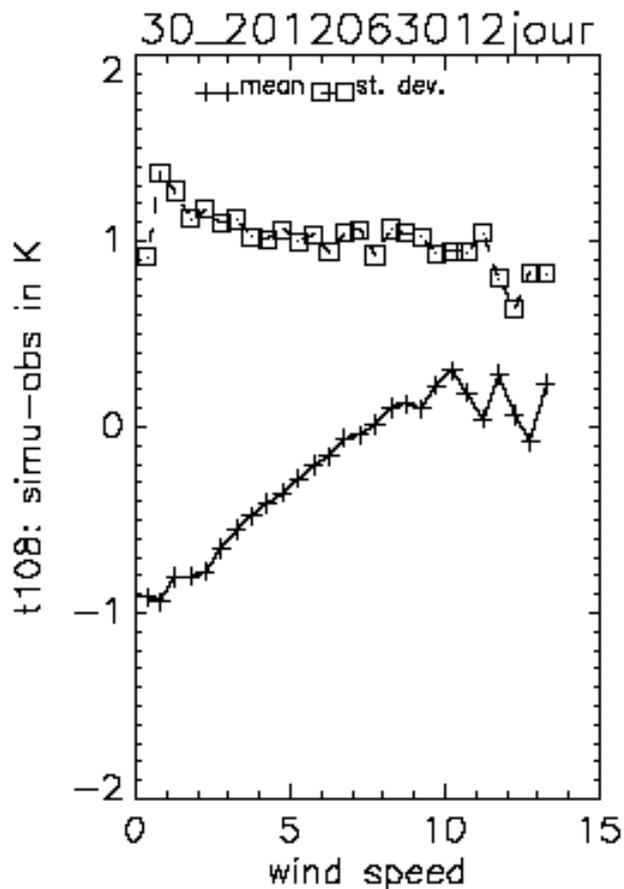
21 June 2013

DATA SET: btsglb_metop02_20120618_120000
METOP BT simulation experiment

model wind (m/s)

21 June 2013

Arctic BT adjustment main issue:



OSTIA too cold (DW or other reasons)

- > simulations too cold
- > simulations over corrected
- > simulated SSTs too large
- > excessive (negative) corrections.

Conclusion

- METOP-A Prototype has been run for several months
- Global Results are improved
- Regional biases are significantly reduced
- Arctic poses a specific problem of BT adjustment
(low winds , permanent daytime conditions)

- Preoperational chain should be ready in February 2014