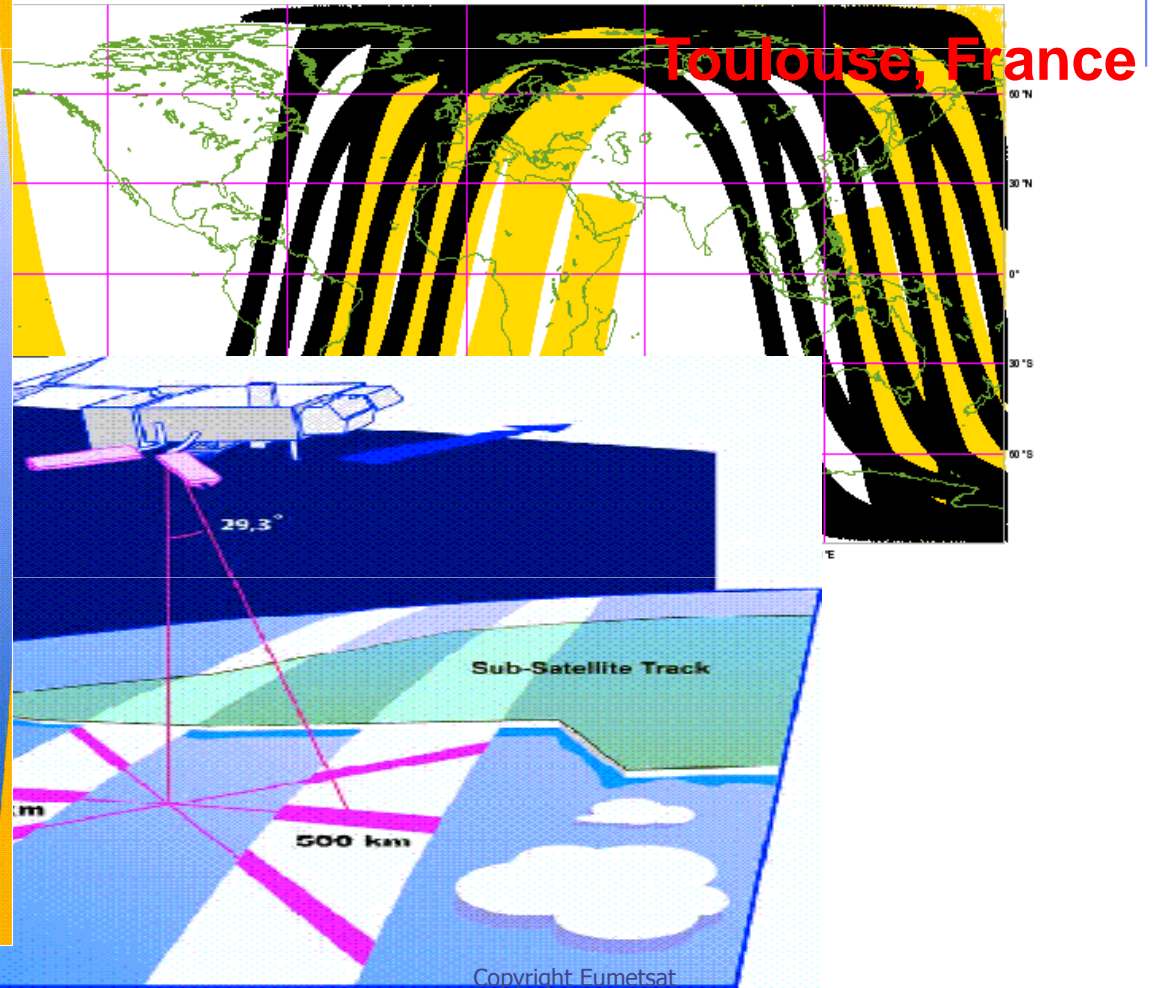
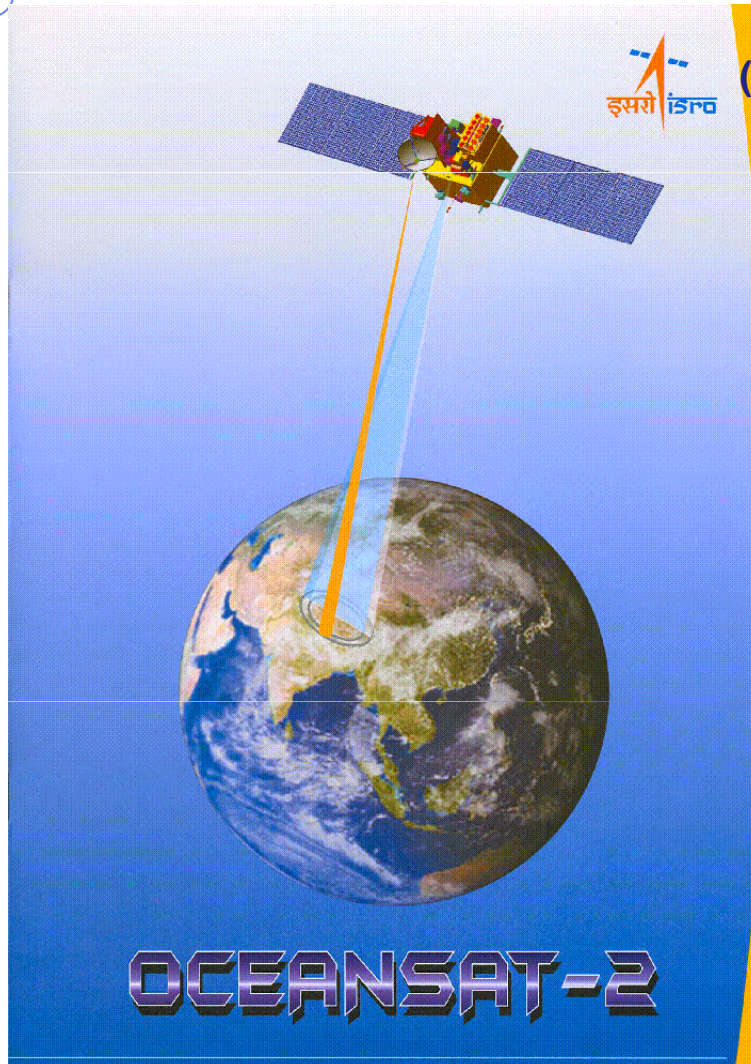


Scatterometer winds at Météo-France

Christophe Payan⁽¹⁾ and Hervé Benichou⁽²⁾

(1) CNRM-GAME, CNRS and Météo-France

(2) Direction de la Prévision, Météo-France



Outline

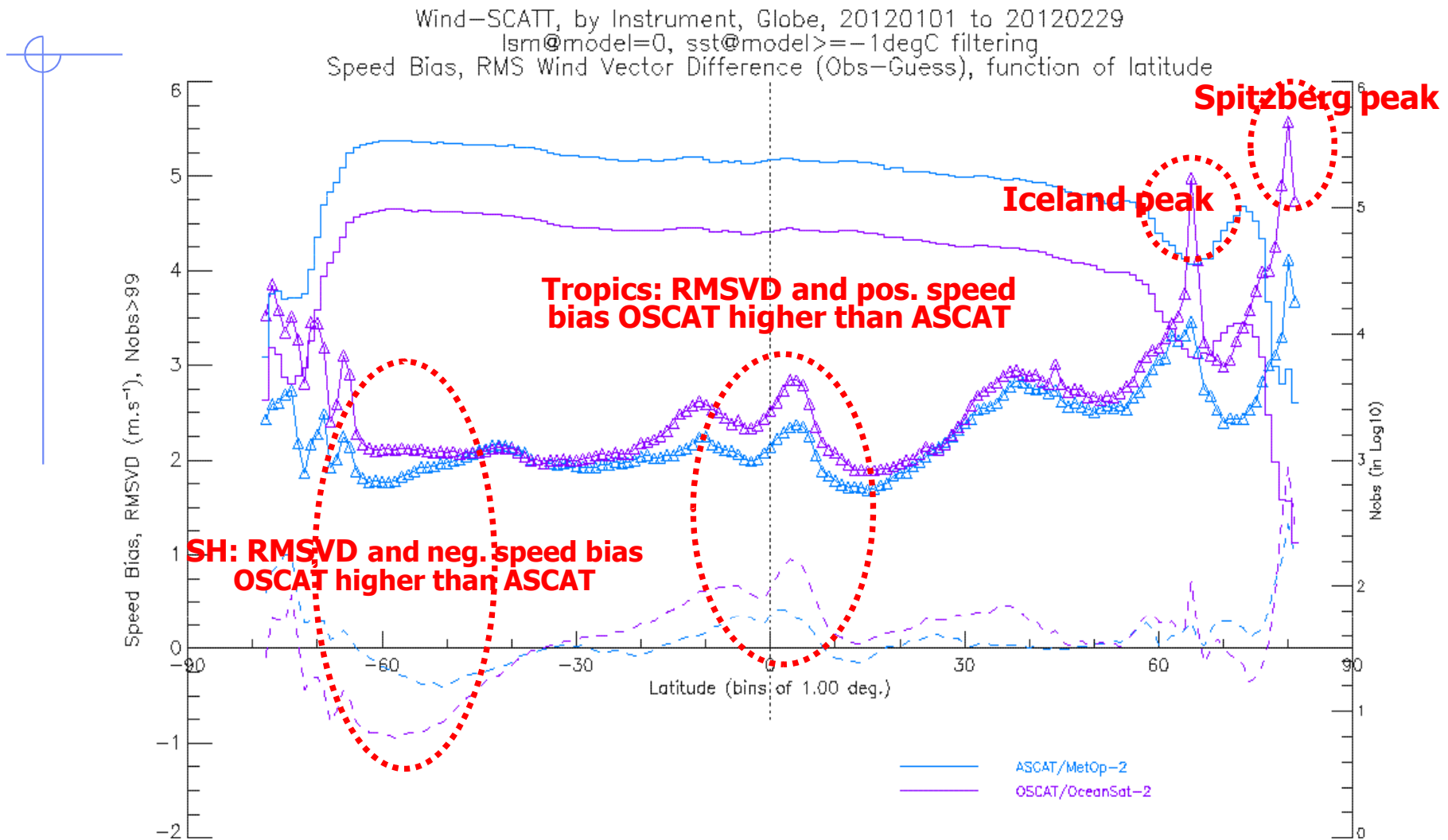
- Evaluation of OSCAT winds (ISRO satellite OceanSat-2, KNMI processing for the Eumetsat OSI-SAF)
- Changes in the use of ASCAT winds (KNMI processing): QC, best wind selection and errors specified for assimilation
- First results with OSCAT winds assimilation

Scatterometer winds background

- Only ASCAT winds, 25km-grid, are used after the loss of QuikSCAT in 2009 and the stop of ERS-2 in 2011
- Neutral wind operator used in assimilation (2009)
- QC using model land-sea mask (no land fraction), ice contamination based on model SST (safe threshold of 5°C fixed with QuikSCAT in 2004) and KNMI flags (distance to cone, monitoring and variational control flags)
- Thinning at 100km for removing correlations between observations
- De-aliasing made at each outer-loop in 4DVar algorithm (when new model trajectory is run after increment correction), choice of wind solution closest to trajectory (2 most likely solutions for ASCAT), 2 loops

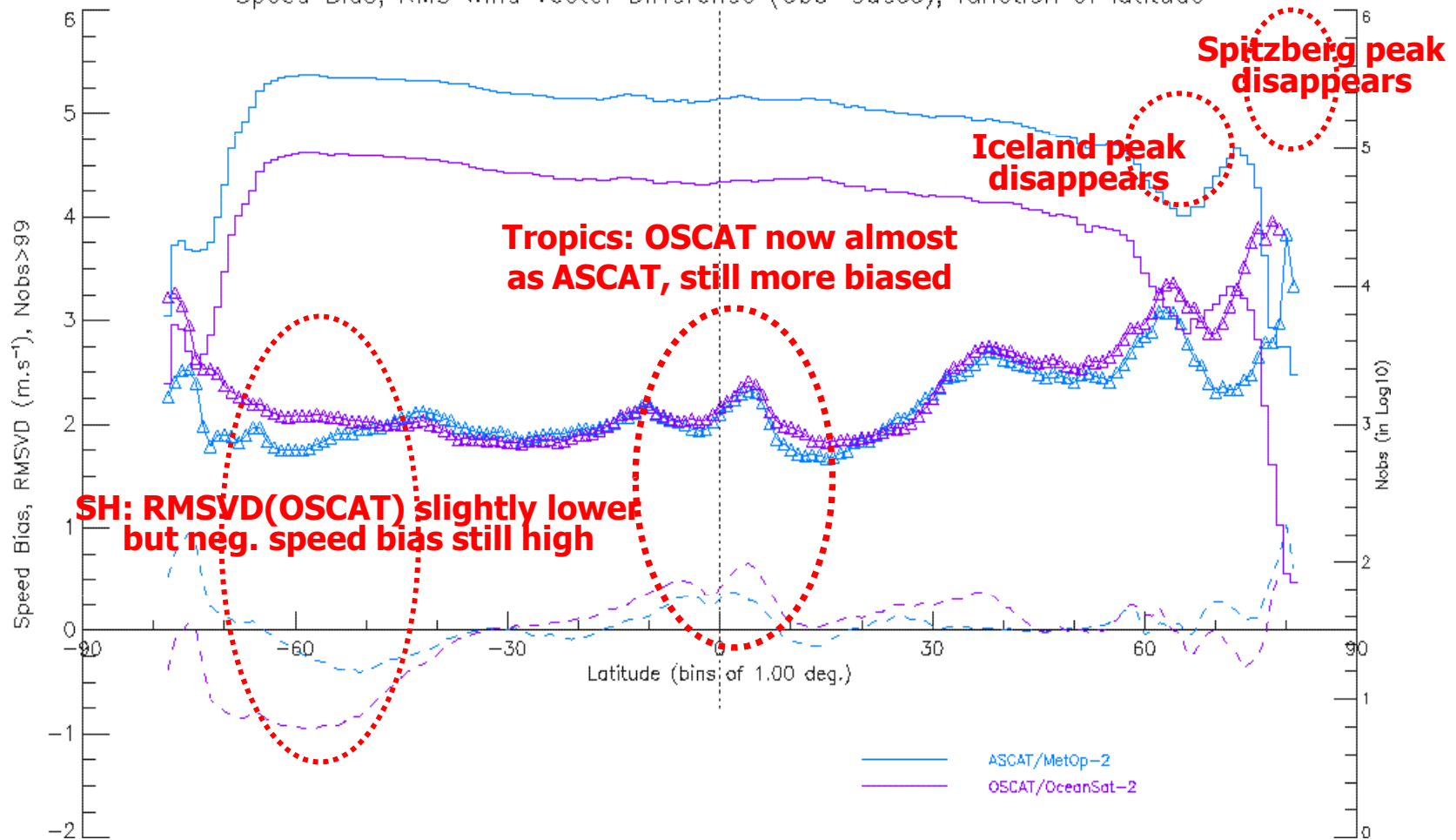
RMSVD and speed bias (o-b) versus latitude (ASCAT/OSCAT)

$lsm@mod=0, sst@mod \geq -1^{\circ}C$



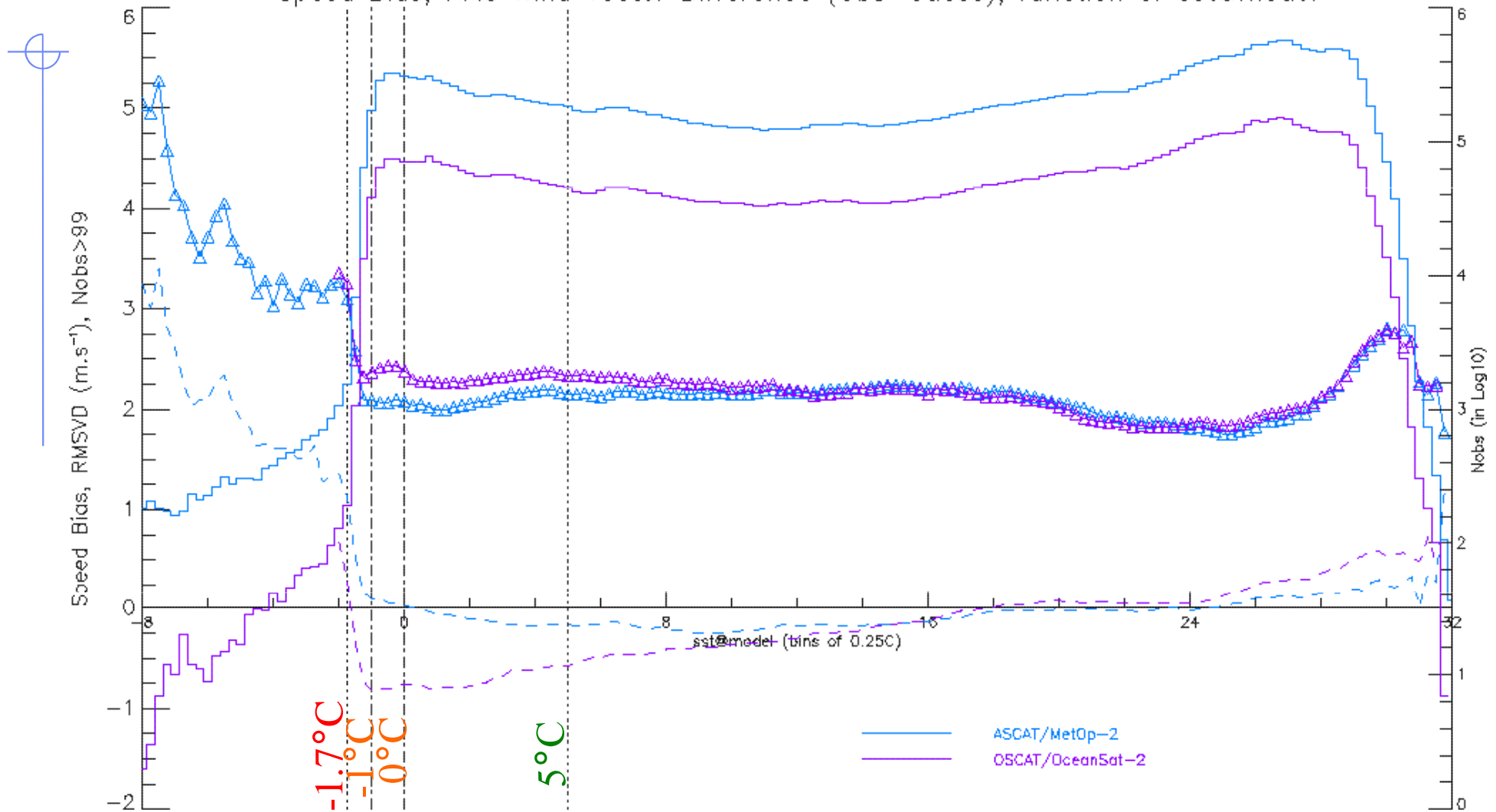
RMSVD and speed bias (o-b) versus latitude (ASCAT/OSCAT) quality_flags@knmi filtering added

Wind-SCATT, by Instrument, Globe, 20120101 to 20120229
 lsm@model=0, sst@model>=-1degC, quality_flags@knmi filtering
 Speed Bias, RMS Wind Vector Difference (Obs-Guess), function of latitude



RMSVD and speed bias (o-b) versus sst@mod (ASCAT/OSCAT) lsm@mod=0, quality_flags@knmi filtering

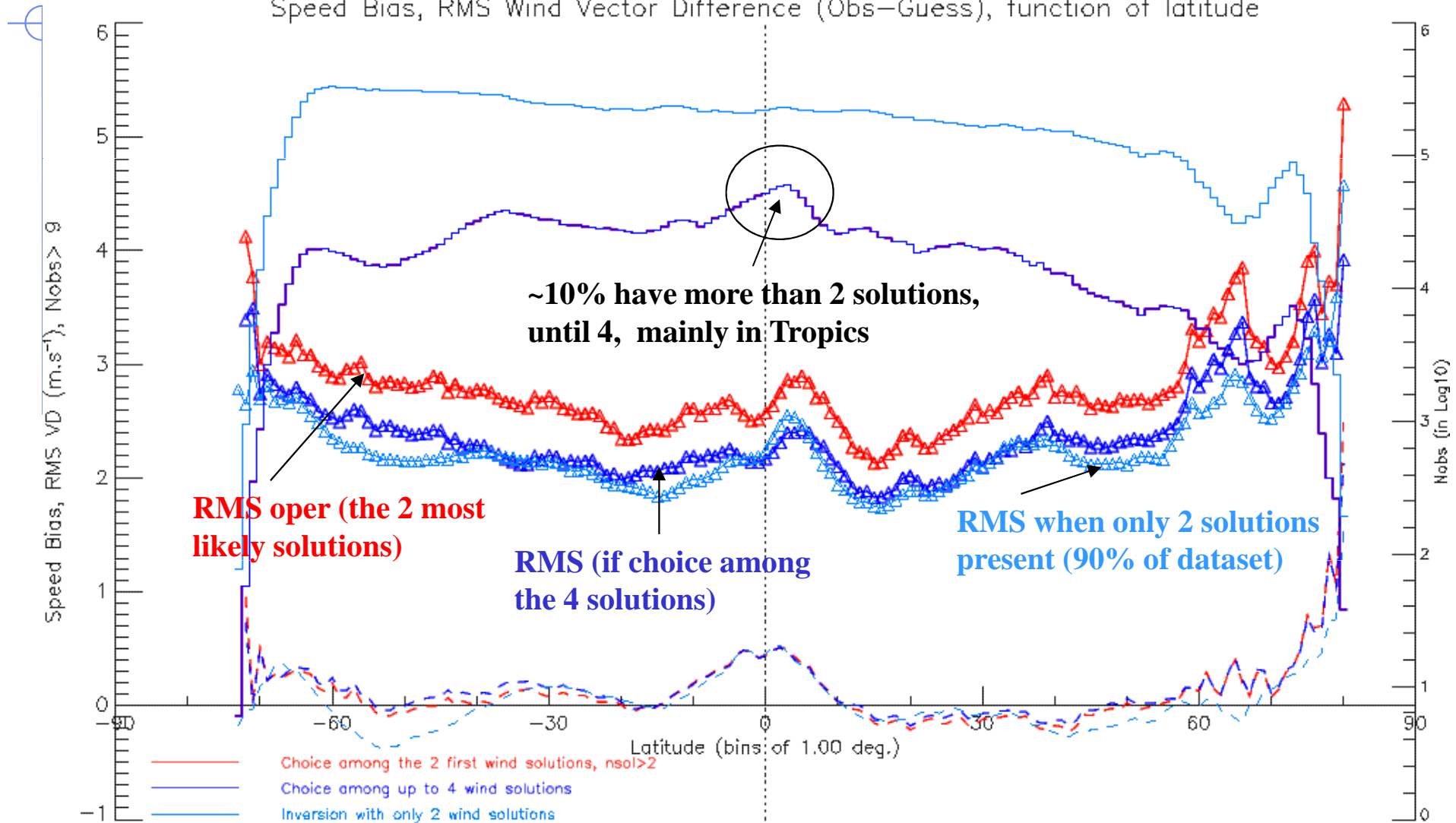
Wind-SCATT, by Instrument, Globe, 20120101 to 20120229
lsm@model=0, quality_flags@knmi filtering
Speed Bias, RMS Wind Vector Difference (Obs-Guess), function of sst@model



Over sea-ice, backscatter signal is stronger and more isotropic => positive speed bias + higher errors

Until 4 solutions for ASCAT in the KNMI product since 2010? statistics=f(latitude), after QC filtering

Wind-SCATT, ASCAT/MetOp-2, Globe, 20110317 to 20110514
lsm@model=0, sst@model, quality_flags filtering
Speed Bias, RMS Wind Vector Difference (Obs-Guess), function of latitude



Proposed changes in the current e-suite:

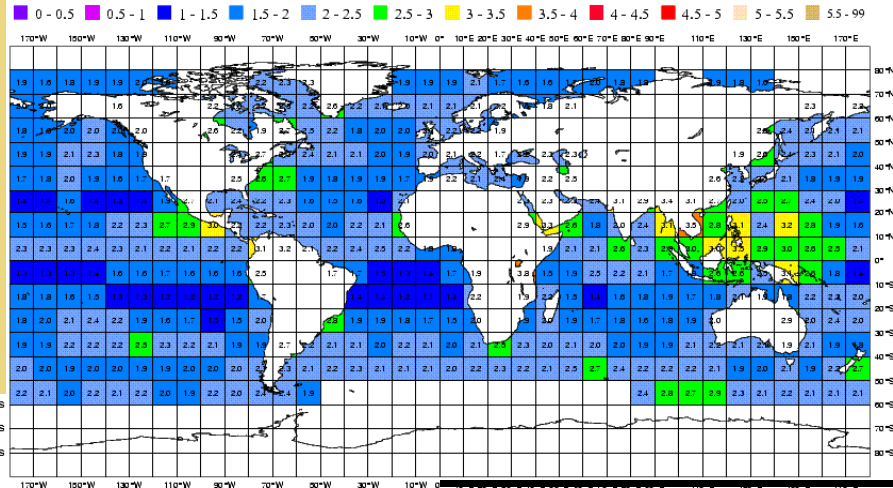
- Changes:
 - SST threshold for ice is now -1°C
 - ASCAT: wind solution choice among 4 solutions when present
 - ASCAT specified errors are now 1.4m/s for U-comp, 1.6m/s for V-comp, based on (O-B) statistics (1.8m/s before)
- Testing with the global atmospheric model ARPEGE, 1 month experiment (mid-August to mid-September 2011), operational run as reference
- OSCAT not (still) operational, so changes only tested with ASCAT winds.

ASCAT winds changes impacts

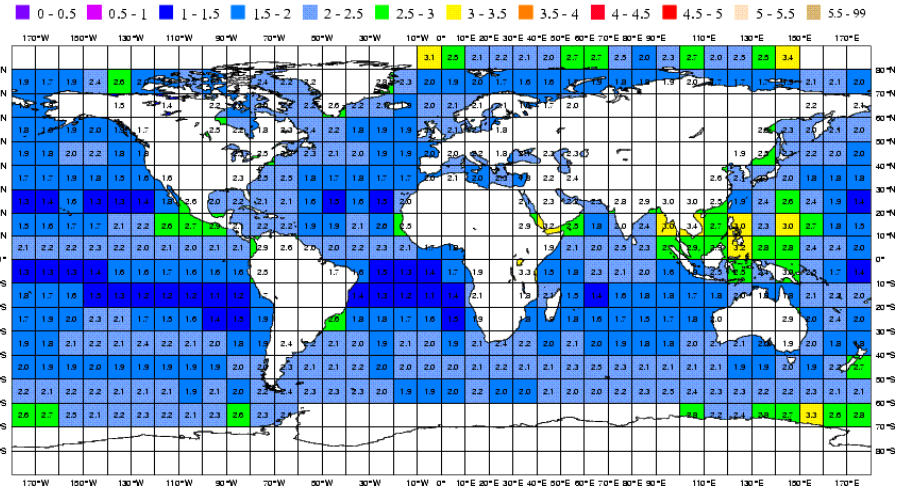
REFERENCE

EXPERIMENT

Operational ARPEGE MONITORING : 20/08/2011 - 19/09/2011
RMS Vector wind Difference, used cells: METOP A
global RMSVD: 2.1 m/s



Experimental ARPEGE MONITORING : 20/08/2011 - 19/09/2011
RMS Vector wind Difference, used cells: METOP A
global RMSVD: 2.1 m/s

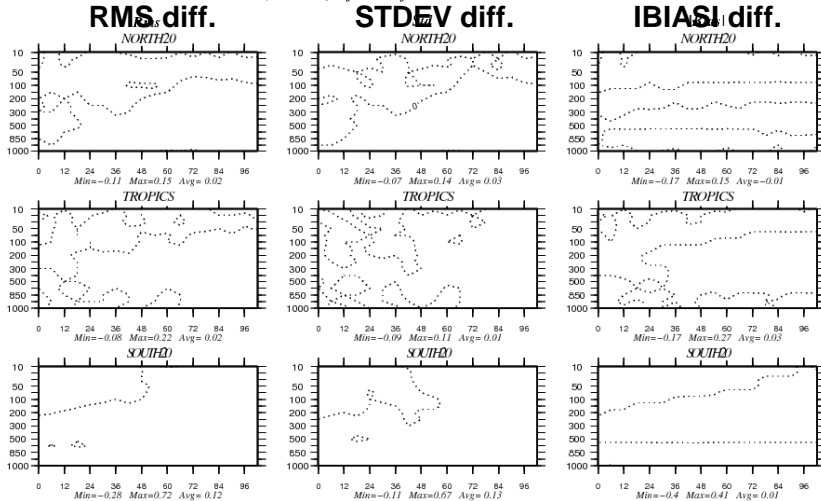


ASCAT using

Forecast Scores on Z
CTRL: IFS analysis

GEOPOTENTIAL: PB250.r 00/AC(Ref)-PB274.r 00/AC(Exp)
(1. m)

31 simulations (500 hPa) of 102 h from 20110820 to 20110923



=> Z scores neutral (dotted lines), rather positive

BOOTSTRAP Test on RMS, Geopotential, 31 cases

Domain	SOUTH20									TROPICS									NORTH20									
Range	0	12	24	36	48	60	72	84	96	0	12	24	36	48	60	72	84	96	0	12	24	36	48	60	72	84	96	
10	--	--	--	--	--	--	--	--	--	+	++																	
30	--	--	--	--	--	--	--	--	--																			
50	--	--	--	--	--	--	--	--	--	+	-	-																
100	--	--	--	--	--	--	--	--	--																			
150	--	--	--	--	--	--	--	--	--	+																		
200																												
250	+	+												+	+													
300	++	++														++	+	++	++									
400	++	++														++	++	++	++									
500	++															++	++	++	++									
700																												
850	++	++	++	+																								
925	++	++	++	++	+																							
1000	++	++	+																								++	

+/- : 99%

... that EXP is better/worse

+/- : 99.9%

First experiment with OSCAT winds:

- Same QC as for ASCAT applied
- OSCAT specified errors are 1.5m/s for both components, based on (O-B) statistics
- Testing with the global model ARPEGE, 1 month experiment (January 2012), pre-operational run as reference (with ASCAT changes)

OSCAT winds assimilation:

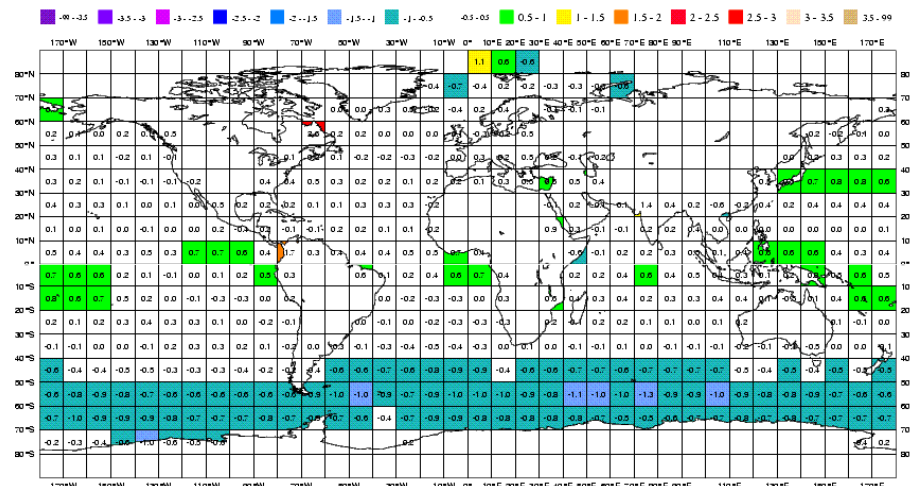
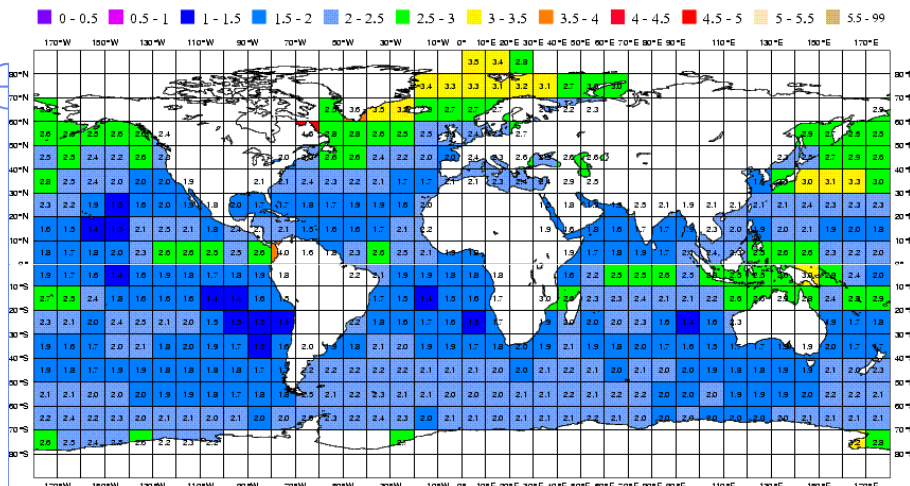
RMSVD

OSCAT assimilation EXPERIMENT : 01/01/2012 - 31/01/2012
 RMS Vector wind Difference, used cells: OCEANSAT 2
 global RMSVD: 2.2 m/s

Speed bias

OSCAT assimilation EXPERIMENT : 01/01/2012 - 31/01/2012
 Wind speed bias (m/s), used cells: OCEANSAT 2
 global bias: -0.1 m/s

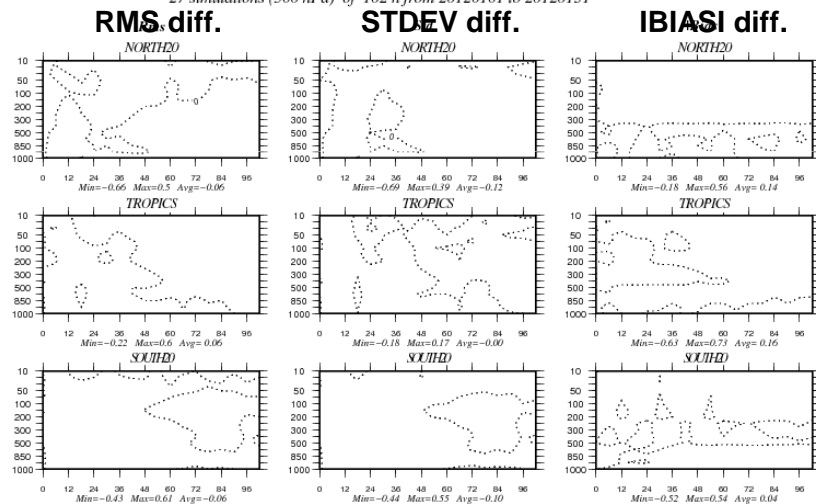
OSCAT using



Forecast Scores on Z
 CTRL: its own analysis

GEOPOTENTIAL: P792S.r 00/A792S(Ref)-PB2EM.r 00/AB2EM(Exp)
 (1. m)

27 simulations (500 hPa) of 102 h from 20120101 to 20120131



=> Z scores neutral (dotted lines), rather negative

BOOTSTRAP Test on RMS, Geopotential, 27 cases

Domain	SOUTH20									TROPICS									NORTH20									
	0	12	24	36	48	60	72	84	96	0	12	24	36	48	60	72	84	96	0	12	24	36	48	60	72	84	96	
10													++					++					++					
30	--	--	--	--	--	--	--	--	--	--	--	--	++		++	++	+						++					
50	--	--	--	--	--	--	--	--	--	--	+	--	++		++	++	+											+
100	--	--	--	--	--	--	--	--	--	--	--	--	--		++	++	++											++
150	--	--	--	--	--	--	--	--	--	--	--	--	++	+	+	+	+											+
200	--	--	--	--	--	--	--	--	--	--	--	--	+	+	+	++												
250	--	--	--	--	--	--	--	--	--	--	--	--		++	++	++	+											
300	--	--	--	--	--	--	--	--	--	--	--	--		+	++	++												
400	--	--	--	--	--	--	--	--	--	--	--	--				++	++											
500	--	--	--	--	--	--	--	--	--	--	--	--		+			++	++										
700	--	--	--	--	--	--	--	--	--	--	--	--					+											
850	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
925	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
1000	--	--	--	--	--	--	--	--	--	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++

+/- : 99%

++/-- : 99.9%

... that EXP is better/worse

Conclusions/Outlook

- OSCAT winds quality almost equivalent to ASCAT, except a negative speed bias higher in the SH.
- Improvements made in the QC of scatterometer winds, applied to ASCAT and with positive impacts on assimilation and forecast scores.
- OSCAT winds assimilation experiment is more ambiguous, the results depending on the chosen model variable, control and areas.
- Nevertheless a common trend is a negative impact in SH, probably due to negative speed bias in OSCAT observations
- Still a little work for fixing this bias issue: what part comes from the model background?
- Ongoing is the dependence of (O-B) departures to observed values and to instrument geometry, for taking account them into errors specified in the assimilation.