Status on the use of scatterometer winds at Météo-France

C. Payan

Météo-France and CNRS

Brief history of Scatterometers use

- QuikScat winds assimilated since 10/2004, in-house inversion with QSCAT-1, only 2 most likely solutions on up to 4 considered.
- ERS-2 winds assimilated since 09/2007, in-house inversion with CMOD5.4.
- Ascat winds on Metop-2 assimilated since 02/2008, from Eumetsat OSI-SAF (KNMI), with CMOD5.
- Impact estimated in the frame of the GSM Arpège, with operational use extended to the LAM models (Aladin and Arome).
- Better quality than similar data (Ships, Buoys), with a global oceanic coverage.
- Neutral or weak positive impact on the forecast scores with, for QuikScat data, a strict selection of the observations, with a high rate of rejection.

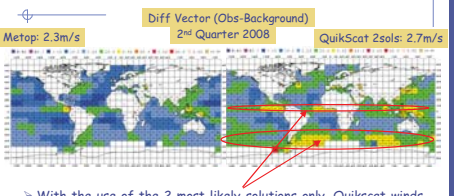
1

Focus on the last two changes

- Use of **4** instead of **2** most likely solutions for Quikscat winds, operational since 07/2008.
- **Neutral** wind instead of **Real** wind in the assimilation, operational since 02/2009.

2

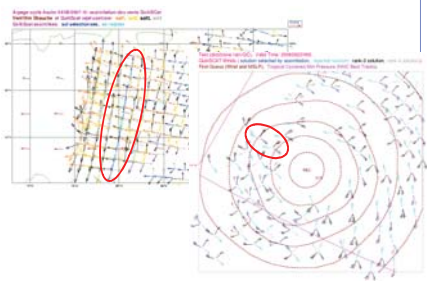
Metop versus QuikScat 2 solutions:



- With the use of the 2 most likely solutions only, Quikscat winds have higher differences than Ascat winds wrt the model background in rainy/strong wind areas (ITCZ, baroclinic areas).

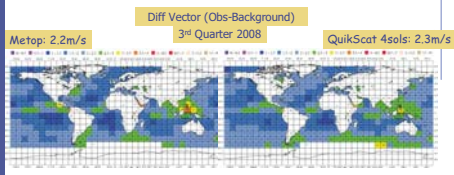
3

QuikScat: 4 solutions instead of 2?



1

Metop versus QuikScat 4 solutions:

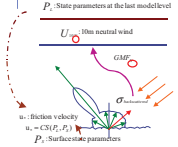


- Differences between Ascat and QuikScat have disappeared with 4 wind solutions for QuikScat.
- Without losing information where differences to the background have already been in agreement (and lower)!
- Test showed nevertheless a neutral impact on forecasts until 4 days!

5

Neutral Wind versus Real Wind?

- Geophysical Model Function: conditions of stability (CS) treated implicitly
- true in mean but source of error for a singular observation
- in theory, $\mathbf{U_{10}}$ = ***GMF*** (σ_o,CS), in practice not possible
- => solution: $\mathbf{U_{10N}}$ = ***GMF***$_{\mathbf{N}}$ (σ_o,CS=neutral)



- observation operator (Geleyn 1987):

$$U_{10N} = U_z [LOG(z_o, z = 10m) - COR(CS)] \,/\, BD(U_z, u_*)$$

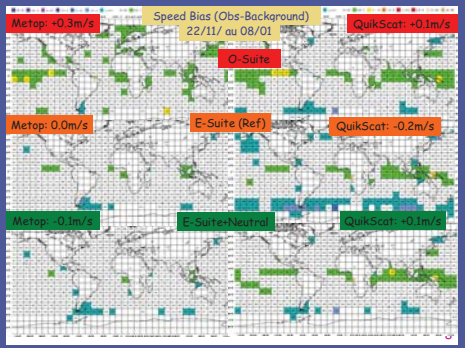
with
U_z model wind at the last level, ~17m
z_o roughness length
LOG logarithmic function of z_o and z
COR corrective term function of stability conditions
BD drag coefficient function of U_z and u_*

6

Neutral Wind versus Real Wind: impact?

- test of neutral wind in the global model Arpège, from 22/11/2008 to 08/01/2009.
- in an emergency context (late due to pb of reproductibility in the surface operator) and after the switch to a neutral product for Ascat winds from KNMI (CMOD5.N used since 20/11).
- reference: E-suite Arpège (with a new scheme of turbulence (Cuxart et al, 2000)). Previous operational scheme based on Louis, 1979.
- for ERS-2 winds, home-made inversion with CMOD5.N and for QuikScat winds, change in the speed bias correction.

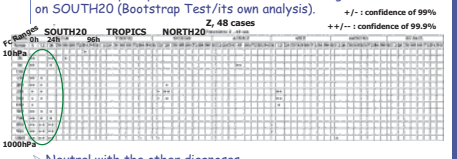
7



8

Neutral Wind versus Real Wind: impact?

- Neutral-wind operator impact is neutral for Ascat/E-suite.
- Speed bias improved for QuikScat/O-suite+E-suite (ITCZ+Mid-latitudes).
- Forecast impact positive/E-suite on the first ranges of forecast, on SOUTH20 (Bootstrap Test/its own analysis). +/- : confidence of 99% ++/-- : confidence of 99.9%

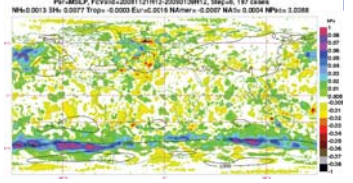


- Neutral with the other diagnoses

9

Neutral Wind versus Real Wind: impact?

- Impact confirmed by the reduction of the analysis increments on the MSLP (in blue):



- Note the impact is more important in the Southern Hemisphere because the land mass fraction is weaker.

10

Summary on the last changes

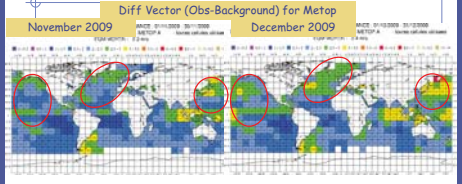
- Equivalent quality between Ascat and QuikScat 4 solutions.
- Neutral-wind operator improves speed bias of QuikScat, is without effect on Ascat after turbulence scheme change and in the end better agreement between the Model and its Analysis.

Outlook

- Quality control improvements (ice,...)
- Tuning of observation errors, thinning,...
- Failure of QuikScat since last November, stop of ERS-2?
- Other instruments (OceanSat-2, ...)?

11

Impact of the QuikScat lost?



- Less good agreement between Ascat winds and model background, since the QuikScat failure.
- Same signal the following months and also by comparaison with the months of the previous year, with the same model version.

12

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

METEO FRANCE
Toujours un temps d'avance