Scatterometer winds at Météo-France

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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>=-1°C

Tropics: RMSVD and pos. speed bias OSCAT higher than ASCAT

SH: RMSVD and neg. speed bias OSCAT higher than ASCAT

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

quality_flags@knmi filtering added

Wind—SCATT, by Instrument, Globe, 20120101 to 20120229

1sm modeling=0, ast@model=1degC, quality_flags@knmi filtering

Speed Bias, RMS Wind Vector Difference (Obs–Guess), function of latitude

Tropics: OSCAT now almost as ASCAT, still more biased

Iceland peak disappears

Spitzberg peak disappears

SH: RMSVD(OSCAT) slightly lower but neg. speed bias still high
RMSVD and speed bias (o-b) versus sst@mod (ASCAT/OSCAT)
lsm@mod=0, quality_flags@knmi filtering

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

International Ocean Vector Winds Science Team Conference 2012, Utrecht, Netherland, 12-14 June
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

rms@model=0, sst@model, quality_flags filtering

Speed Bias, RMS Wind Vector Difference (Obs–Guess), function of latitude

~10% have more than 2 solutions, until 4, mainly in Tropics

RMS oper (the 2 most likely solutions)
RMS when only 2 solutions present (90% of dataset)
RMS (if choice among the 4 solutions)

Choice among the 2 first wind solutions, neos>2
Choice among up to 4 wind solutions
Inversion with only 2 wind solutions
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

RMS Vector wind Difference, used cells: METOP A
global RMSVD: 2.1 m/s

CTRL: IFS analysis

ASCAT using

BOOTSTRAP Test on RMS, Geopotential, 31 cases

GEOPOTENTIAL: PH250 Ref. - PH274 Exp
10 simulations (500 hPa) for 12/01/2011 to 31/10/2011

RMS diff. STDEV diff. IBIASI diff.

FORECAST Scores on Z
CTRL: IFS analysis

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

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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:

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

BOOTSTRAP Test on RMS, Geopotential, 27 cases
forecast scores on Z
CTRL: its own analysis
OSCAT using

GEOPOTENTIAL: P792S_792S(Ref)–PB2EM_r 00/AB2EM(Exp)
27 simulations (500 mb) of 102 h from 20120101 to 20120131

RMS diff. STDEV diff. IBIASI diff.

+=- : 99%
++/--: 99.9%

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

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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.