Scatterometer Wind Services in Europe

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OVWST, 18-20/5/’09
Status SAF activities

Available NWP SAF software
- AWDP1.0 released (ERS and ASCAT)
- SDP2.0 released (SeaWinds)
- 2D-Var settings and NWP guidance
- Coastal AWDP prototype (@25km, 12.5 km in 2009)

OSI SAF winds and services
- ASCAT Cal/Val
- ASCAT 25 km since March 2007 (first L2); operational in Dec 2008
- ASCAT 12.5 km operational
- ASCAT are equivalent neutral winds now - CMOD5.n (0.2 m/s)
- Box averaged product / coastal product validation
- Geophysical modeling (e.g., MLE and CMOD6)
- SeaWinds stream updated for new BUFR (after updated NOAA stream)
- NetCDF defined and available shortly

EARS 30 minutes service
- ERS data in ASCAT format
- ASCAT 25 km & 12.5 km (ascending orbits)

CM SAF ERS scatterometer ocean stress fields climexp.knmi.nl

NWP and OSI SAF support European contribution ISCAT

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MyOcean EU Marine Core Services
Thematic Assembly Centers (TAC)
L3 and L4 wind products

- TACs will feed the global and regional components of the MCS in observation products for space and in situ data.
- Wind products from Sea Ice and Wind TAC
- KNMI manages wind products
- V0 contains the L4 MERSEA project wind maps of IFREMER

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OSI SAF ASCAT product release schedule

<table>
<thead>
<tr>
<th>Product</th>
<th>Coverage</th>
<th>Demonstration</th>
<th>Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 km</td>
<td>Global</td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>12.5 km</td>
<td>Global</td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>Coastal 12.5 km</td>
<td>Global</td>
<td>2009</td>
<td>2011</td>
</tr>
</tbody>
</table>

- Integration of regional EARS products into global OSI SAF products in 2010
- EUMETSAT looks into box filtering of L1B data to support coastal

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Wind Products at

www.knmi.nl/scatterometer

scat@knmi.nl

Demo ERS-2 25 km
Monitoring of each product

- 1st rank MLE
- Speed bias
- RMS u&v scat - EC
- Timeliness
- On-line, NRT

- NWP SAF integrated monitoring at
  www.metoffice.gov.uk/research/interproj/nwpsaf/scatter_report

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ASCAT calibration

Vertical cut for WVC #42

ASCAT L2 winds have been of constant high quality since Feb 2007
A backscatter calibration table is used, different for each L1B release
A CMOD6 is being constructed following the L1B 3-transponder calibration

Level 1b 1st release    Level 1b current release    KNMI total correction

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ASCAT

Unprecedented overall wind statistics after ocean $\sigma^0$ correction

Both against buoys and NWP
Box versus Hamming

- Operational ASCAT $\sigma^0$’s include a spatial Hamming window filter; a box-filtered set has now also been provided by EUMETSAT

- Elaborated 2 tests for product comparison:
  - Dual product collocation with a representative set of buoy data (kindly provided by ECMWF), and NWP data
  - Spectral analysis (as in monday presentation)

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Buoy verification

<table>
<thead>
<tr>
<th>ASCAT 12.5-km product</th>
<th># wind vectors</th>
<th>speed bias</th>
<th>stdev $u$</th>
<th>stdev $v$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamming filtered, operational</td>
<td>2025</td>
<td>-0.11</td>
<td>1.88</td>
<td>1.84</td>
</tr>
<tr>
<td>Box filtered, test set</td>
<td>2002</td>
<td>-0.11</td>
<td>1.89</td>
<td>1.91</td>
</tr>
<tr>
<td>Hamming, collocated with Box winds</td>
<td>1795</td>
<td>-0.09</td>
<td>1.92</td>
<td>1.87</td>
</tr>
<tr>
<td>Box filtered, Hamming collocated</td>
<td>1795</td>
<td>-0.09</td>
<td>1.91</td>
<td>1.88</td>
</tr>
<tr>
<td>Box, hi-res land/sea mask applied</td>
<td>2053</td>
<td>-0.11</td>
<td>1.88</td>
<td>1.92</td>
</tr>
</tbody>
</table>

- QC and quality of Hamming and Box filtered sets appear slightly different
- Collocated Hamming and Box WVCs have very similar buoy verification
- A more accurate land/sea mask provides here some more good-quality WVCs for Box averaging nearer to the coast

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Box AWDP@12.5

- Box averaging leaves more tail variance
- No apparent noise floor or aliasing effect
- Bump remains, but at lower wavelength (?)
- $k^{-1.8}$, pretty close to -1.67 for 3D turbulence (Nastrom and Gage 1987)

- Box product is excellent
Conclusions

• ASCAT winds are stable and of very good quality
• Box-filtered ASCAT $\sigma^0$ data appear preferable over Hamming-filtered data
• ASCAT - ERS continuity after ESA’s ERS reprocessing
• L2 NetCDF winds being released; distribution foreseen through KNMI (NRT), EUMETSAT and PODAAC
• MyOcean Wind TAC; higher level wind products to spatially and temporally contain eddy-scale winds
• ISRO SCAT on OceanSat-2 at 12 LST nicely complements SeaWinds at 6 LST and ASCAT at 9:30 LST; KNMI will be involved in cal/val
• Plan work on SAR hi-res winds (sparse) using SAF scatterometer methodology

➢ We support visiting scientists that support us to develop our products to the standards of the international OVWS community; please contact us

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scat@knmi.nl

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Bias due to $\sigma^0$ averaging

- 100-km product increases low speeds
- At coarser resolutions speeds should be lower instead?

Statistics - speed

- Average bias = -0.52, mean X val = 7.46, mean Y val = 6.94
- Average stdev = 1.09, correlation XY = 0.95
Bias due to $\sigma^0$ averaging

- $\sigma^0$ distribution is steep for low values; a low value at a 25-km WVC most likely has a neighbour WVC $\sigma^0$ value that is higher; this removes low (extreme) values when averaging to 100 km.
- The wind vector distribution is flat for low values; a low 25-km WVC most likely has similarly low WVC neighbour amplitudes at varying direction; more low wind vector amplitudes are expected at 100 km.
- 25-km GMF will not provide good 100-km winds!
- We verified that noisier (>Kp) $\sigma^0$ data indeed provide speed bias as well.

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Median Filter AR

2D-Var AR

Improved cold front

Better Around rain
ASCAT 25 compares best to buoys; ASCAT 25 compares best to ECMWF as well.

SeaWinds 25 is slightly noisier than ASCAT 25; SeaWinds 100 compares much better to ECMWF winds than SeaWinds 25.

Low-res products good for global NWP; Hi-res for ocean applications and nowcasting.

<table>
<thead>
<tr>
<th></th>
<th>ASCAT 25</th>
<th>SeaWinds 25</th>
<th>SeaWinds 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD u [m/s]</td>
<td>1.76</td>
<td>1.84</td>
<td>2.19</td>
</tr>
<tr>
<td>SD v [m/s]</td>
<td>1.79</td>
<td>1.83</td>
<td>2.00</td>
</tr>
</tbody>
</table>
Experimental 12.5-km product

➤ See yesterday’s talk
QuikSCAT vs ECMWF

**Wind speed (m/s)**
- **ECMW**: Node: all
- **Z0.625**: Node: all

- **N**: 4540535
- **mx**: 7.50
- **my**: 7.26
- **m(y−x)**: -0.24
- **s(y−x)**: 1.49
- **cor_xy**: 0.91

- **N**: 3855708
- **mx**: 177.46
- **my**: 177.88
- **m(y−x)**: 0.42
- **s(y−x)**: 14.12
- **cor_xy**: 0.99

**Wind dir (deg)**
- **ECMW**: Node: all
- **Z0.625**: Node: all

- **N**: 4540535
- **mx**: 0.23
- **my**: 0.13
- **m(y−x)**: -0.10
- **s(y−x)**: 1.60
- **cor_xy**: 0.97

- **N**: 4540535
- **mx**: 0.74
- **my**: 0.70
- **m(y−x)**: -0.04
- **s(y−x)**: 1.58
- **cor_xy**: 0.96

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ASCAT vs ECMWF

Node: all

Wind speed (m/s) − ECMWF

N=2305231
mx= 7.59 my= 7.55
m(y−x)= −0.05 s(y−x)= 1.28
cor_xy= 0.94

Wind speed (m/s) − Z0.625

N=1965456
mx= 177.57 my= 177.86
m(y−x)= 0.29 s(y−x)= 15.75
cor_xy= 0.99

Wind dir (deg) − ECMWF

Node: all

Wind dir (deg) − Z0.625

N=2305231
mx= 7.59 my= 7.55
m(y−x)= −0.05 s(y−x)= 1.28
cor_xy= 0.94

U comp. (m/s) − ECMWF

Node: all

U comp. (m/s) − Z0.625

N=2305231
mx= 0.23 my= 0.11
m(y−x)= −0.12 s(y−x)= 1.52
cor_xy= 0.97

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V comp. (m/s) − ECMWF

Node: all

V comp. (m/s) − Z0.625

N=2305231
mx= 0.75 my= 0.72
m(y−x)= −0.03 s(y−x)= 1.62
cor_xy= 0.96