Quality of high resolution scatterometer winds
An assessment using spectral analysis and triple collocation

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Data used

For spectra – all operational data from January 2009
• ASCAT-12.5 and ASCAT-25
• SeaWinds-KNMI and SeaWinds-NOAA (25 km)

For triple collocation
• All ASCAT-12.5 buoy collocations 01-10-2008 / 30-11-2009
• All ASCAT-25 buoy collocations 01-11-2007 / 30-11-2009
• All SeaWinds-KNMI and SeaWinds-NOAA buoy collocations 01-11-2007 / 30-11-2009

Only buoys not blacklisted by ECMWF (mostly TOA, coastal US, and coastal Europe). No floating buoys!
Representation error $r^2$ vs $s_{NWP}$

ECMWF spectrum has less small-scale structure than scatterometer spectrum.

Spectrally integrated difference from maximum spatial frequency to $k_{NWP}$ is the representation error, i.e., variance not contained in ECMWF due to small-scale cutoff.

Representation error needed in Triple Collocation
Error standard deviation against $s_{NWP}$ (w.r.t. ECMWF resolution scale)
Error standard deviation from triple collocation (w.r.t. scatterometer resolution scale)

<table>
<thead>
<tr>
<th>Product</th>
<th>Buoy</th>
<th>Scat</th>
<th>Back</th>
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<tbody>
<tr>
<td></td>
<td>u</td>
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</tr>
<tr>
<td>ASCAT-12.5</td>
<td>1.21</td>
<td>1.20</td>
<td>0.69</td>
</tr>
<tr>
<td>ASCAT-25</td>
<td>1.24</td>
<td>1.30</td>
<td>0.65</td>
</tr>
<tr>
<td>SeaWinds-KNMI</td>
<td>1.39</td>
<td>1.44</td>
<td>0.79</td>
</tr>
<tr>
<td>SeaWinds-NOAA</td>
<td>1.39</td>
<td>1.41</td>
<td>1.20</td>
</tr>
</tbody>
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Precision in error standard deviation ~ 0.02 m/s
Conclusions

• ASCAT-Coastal product is coming near $k^{-5/3}$ spectrum found from aircraft measurements
• ECMWF misses small scales
• ASCAT-12.5 product contains more detail than ASCAT-25, but also a little bit more noise
• SeaWinds-KNMI product is better than SeaWinds-NOAA product
• SeaWinds products lie closer to background than ASCAT

• Combination of spectral analysis and triple collocation yields consistent results