EUMETSAT SAFs for high resolution coastal winds

Ad.Stoffelen@knmi.nl
Marcos Portabella
Anton Verhoef
Jeroen Verspeek
Jur Vogelzang

scat@knmi.nl

EuroGOOS, Exeter
Accuray on 50 km scale

- Triple collocation analysis of buoy, scatterometer & NWP

<table>
<thead>
<tr>
<th>Vector RMS error [m/s]</th>
<th>Tropical TAO/PIRATA</th>
<th>Extratropical NDBC/MEDS/UKMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buoy</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Scatterometer</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>ECMWF model</td>
<td>2.0</td>
<td>2.1</td>
</tr>
</tbody>
</table>

- Scatterometer winds provide excellent forcing
- NWP is the worst ocean forcing, but exists everywhere!

EuroGOOS, Exeter
-25% wind variance difference

- Half of wind variance

- 4 times less wind variance

- ECMWF misses 1.2 m/s variance w.r.t. SeaWinds
6-hourly ECMWF update

ECMWF analysis increments are modest wrt spatial deficit
Most mesoscale scatterometer information remains unexploited

EuroGOOS, Exeter
Ocean forcing is dominated by transient or temporal effects

Can eddy-scale ocean forcing be provided at hourly scale?

2D-VAR provides scatterometer analyses; can the increments be advected in time? → Topic in EU GMES MyOcean project

EuroGOOS, Exeter
EU Marine Core Services through MyOcean: Thematic Assembly Centers (TAC)

- TACs will feed the global and regional components of the MCS in observation products for space and in situ data.
- From observation systems to the service centres. Specific requirements from modelling and data assimilations centers as well as from users and downstream services.

EuroGOOS, Exeter
Validation

• L2 products (scat, radiometer)
  - Triple collocation (all players, NWP, buoys)
  - Spatial correlation/spectra
  - Consistency (e.g., MLE)

• L3/L4 product
  - O-A analyses (biases, RMS, An impact)
  - O-B analyses (Advection skill)
  - Including ancillary parameters (stability, current waves, etc.)

EuroGOOS, Exeter
Sea state effect
Extra-tropics

EuroGOOS, Exeter
Stability Effect

Tropics

Extra-tropics

LKB (TAO input; z = 4m)

LKB (ECMWF input; z = 4m)

LKB (GTS input; z = 4m)

LKB (ECMWF input; z = 4m)
Analysis of uncertainties in triple collocation exercise

Table 5 Average and SD of wind component residual biases (after wind calibration) per buoy location, for buoy and ECMWF winds against scatterometer winds, at the Tropics / Extra-tropics

<table>
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<tr>
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<tbody>
<tr>
<td>BIAS (m/s)</td>
<td>0.09 / 0.03</td>
<td>-0.02 / -0.12</td>
<td>0.21 / 0.08</td>
<td>-0.02 / -0.06</td>
</tr>
<tr>
<td>SD (m/s)</td>
<td>0.27 / 0.16</td>
<td>0.13 / 0.24</td>
<td>0.27 / 0.26</td>
<td>0.22 / 0.24</td>
</tr>
</tbody>
</table>

Uncertainties in the Tropics (mainly due to current effects) are similar to uncertainties in the Extra-tropics (mainly due to wind variability)

Portabella and Stoffelen, 2008
compromise between noise & meteorological detail
- Warm steady-flow air discerned from polar gusty air.
- Noise at edges of the swath
Buoy verification

- ASCAT compares best
- ASCAT 25 compares best to ECMWF also
- For SeaWinds, 25 km best represents buoy, 100km best ECMWF
  → Hi-res scat works!

<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>

Collocation result - speed (2476 wind vectors)

Collocation result - direction (2176 wind vectors)