Validation Aspects of Present and Future Operational Metop ATOVS/AVHRR Products

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Validation Aspects of Metop ATOVS/AVHRR

• MHS Validation using Simultaneous Nadir Overpasses with N-19
• AVHRR/VIS Calibration using GOME-2
• Metop-A AMSU Channel 7
• AVHRR/3 Polar Cap Winds
• Two Metops in the Same Orbit
MHS Validation using SNO’s with N-19

SNO on 4. April 2009, 11:16:04 UTC

1. Restriction to co-located pixels (less than 5km distance)
   => 2260 pixels left

2. Restriction to similar viewing angles (less than 3 pixels with the same scanning angles)
   => 245 pixels left

3. Restriction to co-located near nadir views (pixels 35 to 56 only)
   => 62 pixels left

4. Restriction to coincident near nadir views (maximum time difference of 30 seconds)
   => 40 pixels left

Computation of BT Differences
MHS Validation using SNO’s with NOAA-19

=> Significant Bias due to high space view correction factors for NOAA-19

=> High space view correction factors due to wrong noise floor of antenna pattern
MHS Validation using SNO’s with NOAA-19

=> Correction of the antenna pattern
=> Re-calculation of the space view correction for NOAA-19
=> Repetition of the SNO analysis

17th ITSG, Monterey, CA, 14-20 April 2010
AVHRR/3 Validation using GOME-2

~ 500 GOME-2 measurements within the AVHRR/3 Ch.1 window response function

Read-out period (successive reading of the 500 detector pixels): 0.02 seconds
AVHRR/3 Validation using GOME-2

Nominal co-location

Adjusted co-location

Across track: 20% px (~18 km)
Along track: 6% px (~2.5 km)

- Across Track shift is explained by GOME-2 read-out period (geolocation refers to start of the spectrum)
- Along Track shift is very likely a real geolocation difference (investigations ongoing)
- GOME-2 convoluted target reflectances are higher by about 8% (relative value)

Courtesy of Barry Latter et al. (2009)
Objective: Remove AMSU channel 7 from the ATOVS Level 2 (temperature) retrieval

Problem: Temperature Biases of the FRTM are expressed by a polynomial which depends on:
- Satellite zenith angle
- HIRS channels 1,2,3
- AMSU channels 6,7,8,9

=> Generation of an ‘artificial’ AMSU channel 7 brightness temperature using the neighbouring channels 6 and 8
Regression (from orbits #207, #1042, #3987):

\[ BT_7 = 0.487 \, BT_6 + 0.511 \, BT_8 - 1.286 \]
Polar Cap Winds from Metop-A AVHRR/3

- Mapping of AVHRR/3 data over the poles onto a common projection
- Tracking of structures in overlap areas of mapped AVHRR/3 Ch.4 (11 µm) measurements from subsequent orbits
- Determination of heights for tracked targets (AMV: Atmospheric Motion Vector)
- Selection of valid targets through several quality checks (spatial and temporal consistency with surrounding wind vectors)
Validation of Metop-A AVHRR/3 Winds

<table>
<thead>
<tr>
<th></th>
<th>GS-2 vs. Radiosonde Winds</th>
<th>GS-2 vs. Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Bias (m/s)</td>
<td>0.50</td>
<td>1.31</td>
</tr>
<tr>
<td>Speed RMS (m/s)</td>
<td>5.71</td>
<td>6.00</td>
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<tr>
<td>Direction Bias (deg)</td>
<td>4.27</td>
<td>7.79</td>
</tr>
<tr>
<td>Direction RMS (deg)</td>
<td>43.13</td>
<td>55.97</td>
</tr>
<tr>
<td>Mean Speed AMV</td>
<td>18.41</td>
<td>14.20</td>
</tr>
<tr>
<td>Mean Speed Analysis</td>
<td>17.91</td>
<td>12.89</td>
</tr>
<tr>
<td>Sample size</td>
<td>162</td>
<td>55760</td>
</tr>
</tbody>
</table>

Winds will be ready for trial dissemination in the second half of May 2010
Metop-A and Metop-B

Metop-A
Metop-A + Metop-B
Metop-A/B Overlap
Metop-A/B Coincident Scanning Angles

⇒ Potential Applications:
AVHRR/3 winds in non-polar areas
Estimate asymmetric scan bias for AMSU/MHS
Thanks ...

... to all colleagues, who have contributed to this presentation

... to all users, who provided feedback on EPS products’ quality

... to the auditory