Assessment of the TMR/JMR brightness temperatures and products

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Comparison with AMSU-A TBs over Amazonian Forest
Comparison with ECMWF simulations
Validation of the TMR/JMR products using radiosonding measurements
JMR jump/yaw impact
Conclusions
Mean TB over a stable reference target: the Amazonian forest

<table>
<thead>
<tr>
<th></th>
<th>Freq (GHz)</th>
<th>18.0*</th>
<th>18.7</th>
<th>21.0</th>
<th>23.8</th>
<th>31.4</th>
<th>34.0</th>
<th>36.5</th>
<th>37.0</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsu-A at nadir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>285.8</td>
<td>282.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>641</td>
</tr>
<tr>
<td>TMR</td>
<td>278.6</td>
<td>-</td>
<td>278.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>277.6</td>
<td>2160</td>
</tr>
<tr>
<td>JMR</td>
<td>-</td>
<td>283.5</td>
<td>-</td>
<td>283.4</td>
<td>-</td>
<td>280.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>227</td>
</tr>
<tr>
<td>SSM/I</td>
<td>-</td>
<td>284.2</td>
<td>-</td>
<td>283.4</td>
<td>-</td>
<td>280.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14564</td>
</tr>
<tr>
<td>ERS-2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>285.7</td>
<td>-</td>
<td>-</td>
<td>291.9</td>
<td>-</td>
<td>-</td>
<td>3937</td>
</tr>
</tbody>
</table>

- TMR brightness temperatures too low regarding AMSU
- JMR/SSMI in perfect agreement
Comparison between measurements and simulations on ECMWF analyses with the UCL model

- Biases around 2K
- Standard deviation around 3K

No important problem of calibration
TMR 18 GHz drift correction

Stabilisation of the drift

June 1998

C. Ruf correction

dh difference between GDR and bi-frequency (wo 18 GHz) products

TB18 difference between recomputed and product for radiosonding dataset
⇒ After correction of the 18 GHz drift, difference between bifrequency (21 and 37 GHz) products and standard products is constant.
⇒ Efficient correction
TMR products validation using 11 years of ECMWF radiosonding measurements
48093 points

- without TMR drift correction
  - TMR higher 3.9 mm

- with TMR drift correction
  - TMR higher 8.7 mm
JMR/ERS2 products validation using ECMWF radiosounding measurements

JMR higher 5.5 mm
ERS2 lower 3.8 mm
Comparison with radiosonde measurements

<table>
<thead>
<tr>
<th>For radiosonde (X) in [-0.15; 0] m</th>
<th>JMR (mm)</th>
<th>TMR (mm)</th>
<th>TMR* (recomputed)</th>
<th>ERS-2** (recomputed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean(Y-X)</td>
<td>5.5</td>
<td>3.9</td>
<td>8.7</td>
<td>-3.8</td>
</tr>
<tr>
<td>Std(Y-X)</td>
<td>12.3</td>
<td>11.9</td>
<td>11.8</td>
<td>14.9</td>
</tr>
</tbody>
</table>

* 18.0 GHz Measurements corrected for the drift and then re-computation of the wet tropo. corr. (C. Ruf, June 2002)
**measurements adjusted and use of the Envisat NN algorithm (E. Obligis et al., 2003)

⇒ TMR 18 GHz drift correction degrades the product

⇒ JMR and TMR overestimate between 0 and 15 cm
JMR ramp + yaw state dependence

Pointed out by J. Dorandeu and co.

Δ \(2003-2002 = 4 \text{ mm}\)

\[\rightarrow \text{JMR dh lower by 4 mm in 2003}\]
Comparison between 2002 and 2003: daily mean difference between 2 TBs

\[ \Delta_{2003-2002} \approx 0.8 \text{ K} \]

\[ \Delta_{2003-2002} \approx 0.5 \text{ K} \]

\[ \Delta_{2003-2002} \approx -0.2 \text{ K} \]
Comparison between 2002 and 2003:
daily mean for each TB

$\Delta_{2003-2002} \approx 0.16 \text{ K}$

$\Delta_{2003-2002} \approx -0.60 \text{ K}$

$\Delta_{2003-2002} \approx -0.35 \text{ K}$
Mean difference per cycle between TMR and JMR TBs at 1 hour cross-over points

TB34  -0,5 K/year
TB18.7  +0,1 K/year
TB23.8  -1,02 K/year
Survey of the JMR coldest ocean points

JMR time series 18 GHz cold ocean
slope 0.00044 K/day <= 0.16 K/year

JMR time series 24 GHz cold ocean
slope -0.00076 K/day <= -0.28 K/year

JMR time series 34 GHz cold ocean
slope -0.00140 K/day <= -0.51 K/year
3 different estimations of drifts in K/year

<table>
<thead>
<tr>
<th></th>
<th>TB18.7</th>
<th>TB23.8</th>
<th>TB34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily mean</td>
<td>+0.2</td>
<td>-0.6</td>
<td>-0.4</td>
</tr>
<tr>
<td>global</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily differences with TMR X_1h</td>
<td>+0.1</td>
<td>-1.0</td>
<td>-0.5</td>
</tr>
<tr>
<td>very high latitudes &gt; 60°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ocean coldest points</td>
<td>+0.2</td>
<td>-0.3</td>
<td>-0.5</td>
</tr>
<tr>
<td>high latitudes &gt; 40°</td>
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<td></td>
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</tr>
</tbody>
</table>

Mean drifts on the 3 brightness temperatures produce expected behaviour of the bi-frequency algorithms
Conclusions

TMR
- the 18 GHz drift correction degrades the recomputed product versus radiosonding measurements
- strong yaw state dependence
- TMR brightness temperatures appear very stable in time since Jason launch

JMR
- products comparison with radiosonde measurements shows a quite good agreement
- descending ramp on dh during October and November 2002 (cycles 27 to 32)
- since this ramp, the yaw state dependence reappears
- at least TBs of channels 2 and 3 are decreasing

⇒ Instrumental parameters survey is needed to explain these different features