Temperature, Water Vapor, and Relative Humidity over Ice (RHI) retrieved with MIPAS-IMK/IAA data processor from MIPAS low resolution UTLS-1 mode data during the SCOUT-O3 campaign period and comparison to Microwave Limb Sounding v2.2 data

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OUTLINE

- Mode Description
- MIPAS UTLS-1 mode retrieval results for Temperature, $\text{H}_2\text{O}$, Relative Humidity over Ice (RHI; computed), Nov-Dec.2005
- $\text{H}_2\text{O}$ Tropical tape recorder 2003-2008
- Conclusions
<table>
<thead>
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<tbody>
<tr>
<td>Spectral resolution</td>
<td>0.061 cm⁻¹</td>
<td>0.025 cm⁻¹</td>
</tr>
<tr>
<td>Horizontal limb-scan distance</td>
<td>~ 320 km</td>
<td>~ 550 km</td>
</tr>
<tr>
<td>Tangent altitudes</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Tangent altitude range</td>
<td>Dependent on latitude: Pole: 7 - 50 km Equator: 13 - 56 km</td>
<td>Constant with latitude: 7 – 69 km</td>
</tr>
<tr>
<td>Tangent point distances from bottom to top:</td>
<td>9×1.5 km, 3×2 km, 2×3 km, 4×4.5 km</td>
<td>12×3 km, 2×5 km, 2×8 km</td>
</tr>
</tbody>
</table>
• Due to 1.5 km tangent altitude spacing in the lower atmosphere for a given FOV of 3 km, results in over sampling in lowest tangent altitude giving better vertical resolution
• Vertical resolution of 2.5 to 3.5 km is achieved in UTLS region from MIPAS low resolution data
Relative noise error of 0.1 to 0.2 % in case of temp. and 2-5% in case of water vapour in UTLS are due to low instrumental noise in reduced spectral resolution mode and broad micro window selection.
Retrieved temperature field

MIPAS/UTLS mode
Nov-Dec. 2005

MLS/v2.2
Nov-Dec. 2005

ECMWF
• Oscillations in MLS v2.2 temperature at 15 km (reported in Schwartz et al) causes temp. difference of $\pm 2 \text{ K}$ w.r.t MIPAS and ECMWF
• Deficiencies in ECMWF analysis above 40 km causes temp. difference of $\pm 4 \text{ K}$ w.r.t MIPAS and MLS
Retrieved H2O field

MIPAS/UTLS mode
Nov - Dec. 2005

MLS/v2.2
Nov - Dec. 2005

Difference \( H_2O \) MIPAS – MLS

MIPAS – MLS (v2.2),
Nov - Dec. 2005

- Difference (MIPAS – MLS) of ±20% between 13 – 25 km is due to oscillations (Lambert et al) in MLS v2.2 water vapour
- Below 13 km MIPAS water vapour values are higher by >20% w.r.t MLS
Relative Humidity over Ice (RHI)

MIPAS/UTLS mode
Nov - Dec. 2005

MLS/v2.2
Nov- Dec. 2005

• Tropical Upper Tropospheric RHI values retrieved by MIPAS is around 1.0 and by MLS is around 1.2
• Between 14 and 18 km a difference ± 0.2 (20%) RHI values are seen in between MIPAS and MLS
Difference plots of RHI 0-25 km

- Differences in tropical upper tropospheric RHI of ±0.2 (20%) between MIPAS and MLS are due to oscillations in MLS temperature.
H2O tropical tape recorder 2003-2008

Timeseries. H2O 10.0S – 10.0N

COST WaVaCS workshop, Lindenberg Germany, 21-23 May 2008
Conclusions on MIPAS new spectral resolution UTLS-1 mode

**T**: Oscillation in MLS v2.2 Temperature below 30 km (Schwartz et al.,), cause temperature deviation of ±2 K w.r.t. MIPAS and ECMWF
- Deficiencies in ECMWF analysis above 40 km causes difference of ±4 w.r.t MIPAS and MLS

**H$_2$O**: Overall good agreement of MIPAS with MLS v2.2
- MLS reports high values at 12 km (Lambert et al.,) upto 20% but MIPAS is 20% higher than MLS
- MLS is higher in UTLS (along lat. at 15 km) compared to MIPAS by 20%
- At 23 km MLS reports low values due to gain compression and pointing uncertainties (Lambert et al.,) also seen in MIPAS upto 8%

**RHI**: Over the tropics MLS show high RHI values of 1.2 were as MIPAS shows 1.0
- Large differences in RHI is caused due to MLS temperature oscillations
Reference

Schwartz et al., ”Validation of Aura Microwave Limb Sounding Temperature and Geopotential Height measurements” JGR in press, Jan. 2008

THANK YOU