GOMOS Ozone Profile Validation
ACVT subgroup

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CNRS/IPSL
Comparison with SAGE III

- Pair comparison
- Pair selection criteria:
  - Time difference within 24 hours
  - Latitude difference within 3 degree
  - Longitude difference within 10 degree
- May, June, and July 2002 data for GOMOS twilight
data comparison
- 12 months of 2002 SAGE III Lunar data used for
  comparison with GOMOS twilight data
SAGE III (Solar) – GOMOS (Twilight)
SAGE III (Lunar) - GOMOS (Twilight)
SAGE III (Lunar) – GOMOS (Dark)
Conclusions

- SAGE III solar data agrees well with GOMOS twilight data with positive bias of about 6% from 18 to 50 Km
- SAGE III Lunar data agrees well with GOMOS twilight data to within 5% from 18 to 40 Km altitude
- SAGE III Lunar data agrees very well with GOMOS dark data for 17 pair profiles. Need more coincident measurements for statistical significance
- Lighted data from GOMOS compares poorly with SAGE III data
GOMOS O$_3$ validation with POAMIII
AO317 : F. Goutail, A. Bazureau
Service d’Aéronomie, CNRS/IPSL, France

- Two latitudes $53^\circ$-71$^\circ$N and $57^\circ$-65$^\circ$S
- From Aug. 2002 to Feb. 2003

Twilight observation conditions: 258 files
198 coincidences in Northern Hemisphere
80 coincidences in Southern Hemisphere

Coincidence Criteria: 600km, 24h

<table>
<thead>
<tr>
<th></th>
<th>Northern Hemisphere</th>
<th>Southern Hemisphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>O$_3$</td>
<td>5 to 10% (13-60 km)</td>
<td>5 to 10% (13-60 km)</td>
</tr>
</tbody>
</table>
Northern Hemisphere

Correct profile

POAM
GOMOS

Mag = 1.16

Unrealistic profile

Mag = 2.85
Northern Hemisphere

Mean Relative Difference (%)

With all stars

Mean Bias 8% (+/- 3%) 25-55 km
STD : > 40 km = 5%
< 40 km = 10 to 15%

Strong stars ONLY (Mag < 1.2)

Bias 2% 40-55 km
Negative bias below 40 km
STD : > 40 km = 3%
Southern Hemisphere

Example of profile

Mean Relative Difference (%)

No star dependence revealed...

Why? Strong stars only?

Quality better than in Northern Hemisphere: why?...

It seems that there is a Problem of altitude registration POAM / GOMOS?
Conclusion

- If only realistic profiles taken into account

- Northern Hemisphere:
  - Bias 2% 40-55 km
  - Negative bias 8% 20-40 km
  - STDeviation: > 40 km = 3%
  - Below 20 km unrealistic

- Southern hemisphere
  - 40-55 km positive bias 8%
  - 20-40 km no bias but large deviation: ± 8%
  - Below 20: unrealistic
Validation of GOMOS-Lv-2 data $O_3$
product GOPR 6.0a with SAGE II 6.2

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Comparison of GOMOS (6.0a) O₃ profiles with SAGE II (6.2)

367 collocations for 01.09.02 - 31.03.03:
157 at 30°-60°, 96 at 30°- -30°, 56 at -60°- -90°, and 58 at -30°- -60°
177 dark, 7 daylight, 30 twilight, 97 straylight, 56 twi- and stralight observations

Examples from high southern latitudes

GOMOS twi- and straylight  GOMOS twilight  GOMOS daylight

SAGE II within 250 km of GOMOS measurements during the same day

Accuracy of SAGE II O₃-Profiles at 10-50 km 10%

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Comparison of GOMOS (6.0a) O₃ profiles with SAGE II (6.2)

- Mid northern latitudes
  - GOMOS dark
  - GOMOS straylight

- Tropics
  - GOMOS dark

Nearly all collocations show good agreement to SAGE II from ~20 km until the altitudes were SAGE II ozone is validated!
Comparison of GOMOS (6.0a) $O_3$ profiles with SAGE II (6.2)

STATISTICS: GOMOS-SAGE II/SAGE II

<table>
<thead>
<tr>
<th>GOMOS dark</th>
<th>mean rel. deviation</th>
<th>RMS</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>dark at 21 – 52 km</td>
<td>-5 – 0%</td>
<td>5 – 15%</td>
<td>177</td>
</tr>
<tr>
<td>GOMOS straylight</td>
<td>-7 – 0%</td>
<td>6 – 15%</td>
<td>97</td>
</tr>
<tr>
<td>twilight at 17 – 57 km</td>
<td>± 5%</td>
<td>6 – 15%</td>
<td>30</td>
</tr>
<tr>
<td>daylight at 17 – 58 km</td>
<td>±10%</td>
<td>3 – 15%</td>
<td>7</td>
</tr>
</tbody>
</table>

Statistics over all comparisons:

- GOMOS-SAGE II/SAGE II
- IUP Bremen ©bracher@uni-bremen.de
Overall Conclusions

- Precision of GOMOS ozone profiles
  - Based on GOMOS comparisons with SAGE III, SAGE II and POAM III, the precision of GOMOS ozone profile is within 15% between 20 Km and 40 Km.

- Accuracy of GOMOS ozone profiles
  - From the comparisons, the mean difference of GOMOS ozone profiles to the three other satellite instruments is within 10% between 20 Km and 40 Km. GOMOS data appears to be positively bias.