INSTRUMENT SUMMARY

GOMOS
General Issues

- GOMOS retrieval performance has considerably improved since ACVE-1 (2002)
- Accuracy and precision depend on stellar magnitude & temperature, and obliquity
  → validation needs comprehensive statistics
- Limb condition (dark, bright, twilight/straylight) is critical for data product quality (→ user: read disclaimer carefully!)
Profile Selection

- For use of single profiles, select profiles properly:
  - dark & twilight/straylight are preferred
  - star magnitude & colour depending on the species
  - obliquity
  - check PCD (inversion quality check)
  - eliminate flagged data!!
Ozone

- Comparison with ground-based and satellite solar/lunar occultations:
  - 0 to -5% bias in range 18-50km
  - RMS with respect to reference ground based data sets: 10-15% (18-50km)
    SAGE II: 5-15% (≈20-50km)
  - assimilation: precision <5% (25-40km) for ≈60%(tbc) of data

\[ \text{above 50km} \]
\[ \Rightarrow \text{beware of diurnal variability} \]
Temperature & Density

- High-resolution temperature profile (HRTP) data (Disclaimer: data not valid!):
  - 25-50% of HRTP data “unrealistic” → not used for analysis.
  - Precision of “realistic” HRTP (from comparison to POAM III sat. & SAOZ balloon, consistent with ground-based results):
    - < 20km 10-12K
    - 20-30km 2-4K (best in tropics)
    - 30-40km 15K (10K@38km for ground-based)
  - Bias (from ground-based comparison):
    - 25-32km +5-10K (decreasing above)

- Data quality labelling poor
- Better data quality check & labelling needed
Temperature & Density

- Density - only 1 comp. with ALOMAR ozone lidar: agreement within 5-10%, but statistically insignificant

- Temperature retrievals from Rayleigh/O2 not available

- Recommendation: include ECMWF for T validation

- HRTP will be difficult to validate due to collocation problems (short spatial correlation length of small-scale atmospheric effects) and differences in observational geometries
H2O

- Insufficient GOMOS data available for significant comparison
- Sanity checks (comp. with ELHYSA & sonde profiles) shows that some GOMOS H2O measurements are in right order of magnitude
- Bright-limb data appear not useful at all
- Significant work ahead before quantitative H2O validation would make sense
- Recommendation: include ground-based passive microwave sounders in validation data sets
Aerosol

- Detection of PSC (aerosol extinction) has proven to be possible
- However, GOMOS aerosol model (1/λ) has to be checked; also physically questionable. Benefit of any aerosol model has to be evaluated w.r.t. interference with other species
- PMC not yet observed in absorption
Conclusions

Species validated
- Good Quality: O3
- Reasonable Quality: NO2 total stratospheric amount
- Insufficient Quality: H2O (very small data set available), HRTP, aerosol

Species still to be validated
- T (Rayleigh/O2), (OClO)

Recommendations for future validation work
- Ozone is primary mission goal → continued validation recommended
- Algorithms: evaluate concurrent algo’s on same GOMOS transmittances
- Include inter-comparisons with MIPAS/SCIA, ground-based MW (H2O), ECMWF (strat. temperatures)
- Re-evaluate mission scenario (star selections), w.r.t. instrument and scientific objectives