Diurnal Variation of Stratospheric and Mesospheric Ozone Observed by Ground-based Microwave Radiometry

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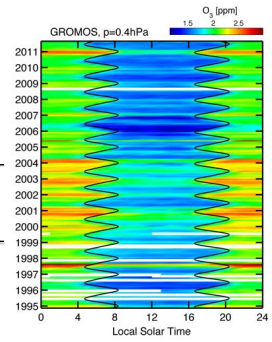
Introduction

- The microwave radiometer GROMOS measures ozone profiles at day and night since 1994
- Characteristics, anomalies, and interannual variations of the daily ozone cycle can be derived from the data set of GROMOS at Bern (47°N, 7°E)
- Atmospheric composition changes, dynamics, and solar variability ➔ impact on diurnal ozone variation?

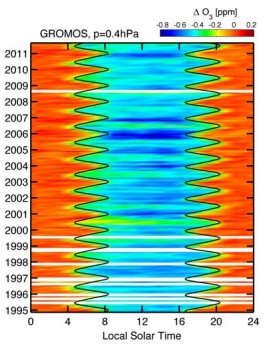
Interannual Variation of the Daily Ozone Cycle

Lower mesosphere
p=0.4 hPa

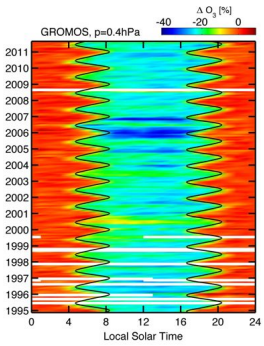
solar maximum



O_3



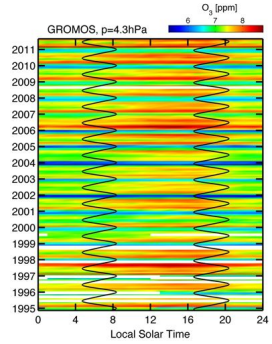
$O_3 - O_{3,midnight}$

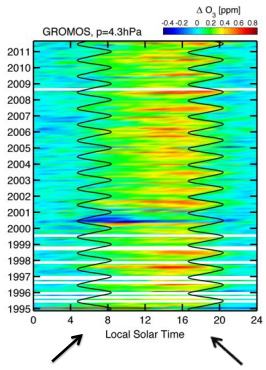


$$\frac{O_3 - O_{3,midnight}}{O_{3,midnight}}$$

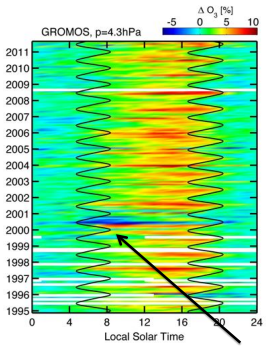
SSW 2006?

Stratosphere
p=4.3 hPa





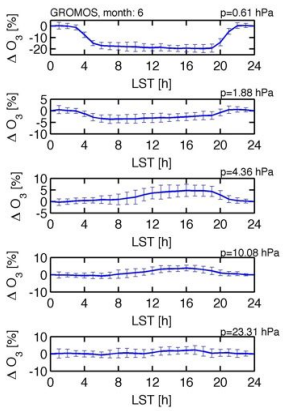
solar zenith angle Θ=90°



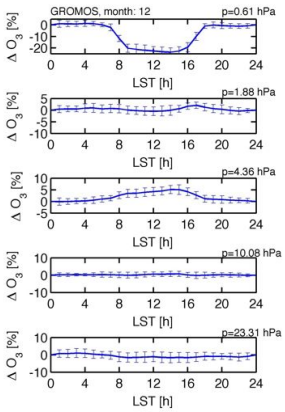
NO anomaly after sunrise?

Mean Daily Ozone Cycle (1994-2011)

June



December



Conclusions

- Observational results of GROMOS look very promising
- Anomalies of NO and OH could be a reason for interannual variations of the daily ozone cycle
- Cross-validations and numerical simulations follow soon
- Daily ozone cycle is a challenge for instruments, retrieval techniques, and chemistry-climate models

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