Supporting Information for "Evaluation of ozone trends in the mesosphere/lower thermosphere using a new merged dataset of ozone profiles"

Monika E. Szelag[1], Viktoria F. Sofieva[1], Edward Malina[2], Pekka T. Verronen[1,3], Michelle L. Santee[4], Manuel López-Puertas[5], Bernd Funke[5], Gabriele Stiller[6], Alexandra Laeng[6], Kaley A. Walker[7], Patrick E. Sheese[7], Mark E. Hervig[8], Benjamin T. Marshall[9]

[1] Finnish Meteorological Institute, Helsinki, Finland
[2] ESA/ESRIN, Frascati, Italy
[3] Sodankylä Geophysical Observatory, University of Oulu, Sodankylä, Finland
[4] Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA
[5] Instituto de Astrofísica de Andalucía, CSIC, Granada, Spain
[6] Karlsruhe Institute of Technology, Karlsruhe, Germany
[7] Department of Physics, University of Toronto, Toronto, Canada
[8] GATS, Driggs, Idaho, USA
[9] GATS, Hampton, Virginia, USA

Correspondence to: monika.szelag@fmi.fi

Contents

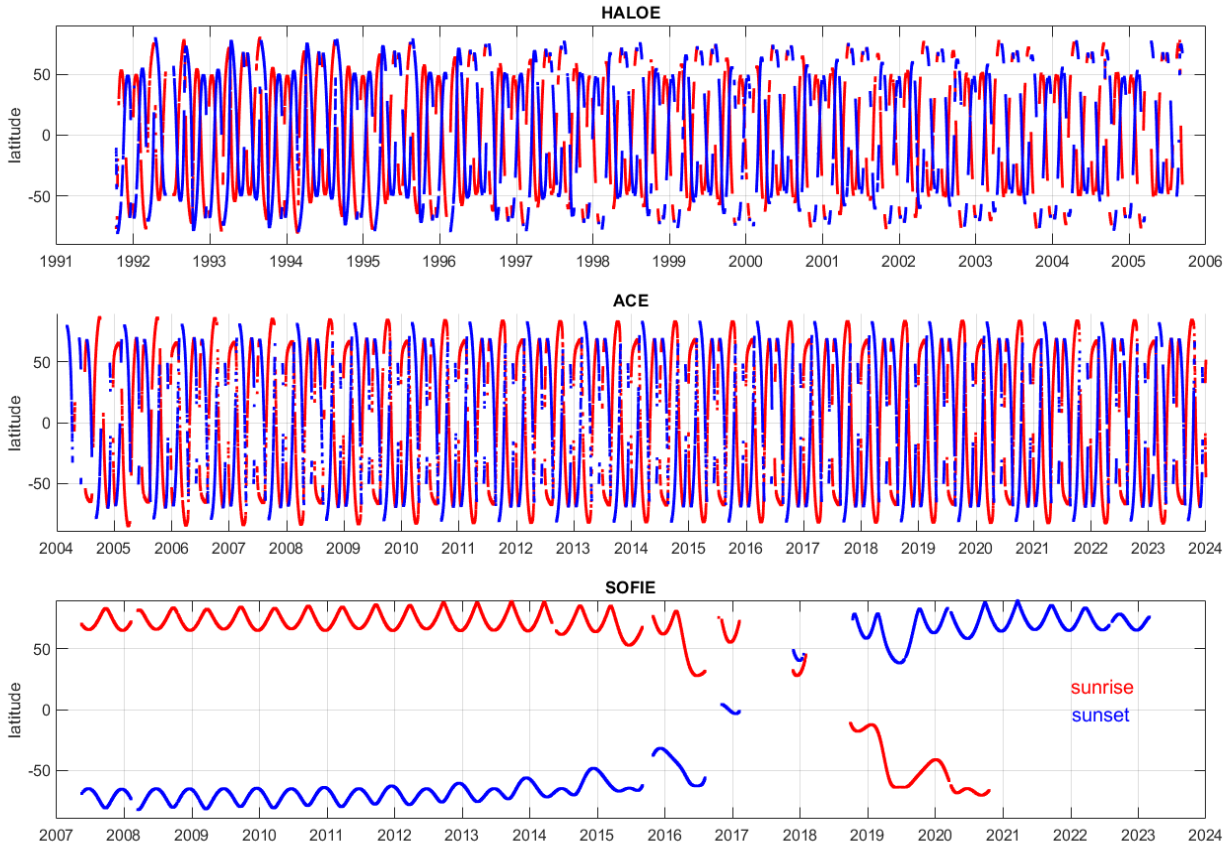

Figure S1: Latitude coverage by solar occultation measurements.

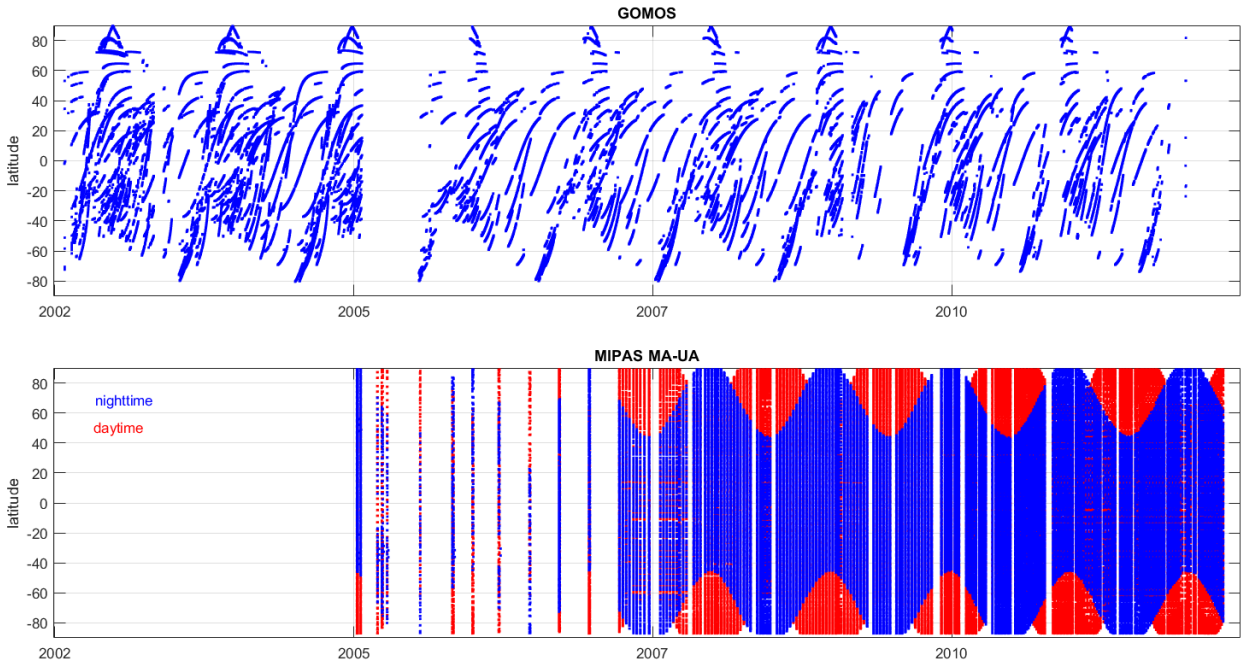

Figure S2: Latitude coverage by GOMOS and MIPAS_MA_UA mode.

2. Conversion of GOMOS ozone profiles to pressure grid

GOMOS provides ozone number density profiles on an altitude grid. Since the temperature and pressure profiles in the GOMOS files are based on a combination of ECMWF analyses and the MSIS90 model and are therefore not very accurate, we applied the following approach. First, we computed monthly zonal means on the altitude grid. Then, we used the altitude-pressure relationship derived from MIPAS_MA_UA measurements to represent GOMOS profiles on a pressure grid. After 2007, when MIPAS_MA_UA provided dense coverage, altitude-pressure conversion profiles were used for each month and latitude zone. Before 2007, when MIPAS_MA_UA coverage was rather sparse, we used a climatology of altitude-pressure conversion derived from MIPAS data (i.e., conversion factors as a function of calendar month, latitude, and altitude). Figure S3 shows the differences in the altitude-pressure relationship when the original GOMOS pressure profiles are used (Figure S3, top) and after conversion using MIPAS_MA_-UA data (Figure S3, bottom). When the original pressure data from the GOMOS files are used, the altitude differences can reach up to 1 km in the mesosphere and lower thermosphere. After conversion using MIPAS_MA_UA data, the altitude difference is exactly zero after 2007 by construction and does not exceed 0.5 km before 2007.

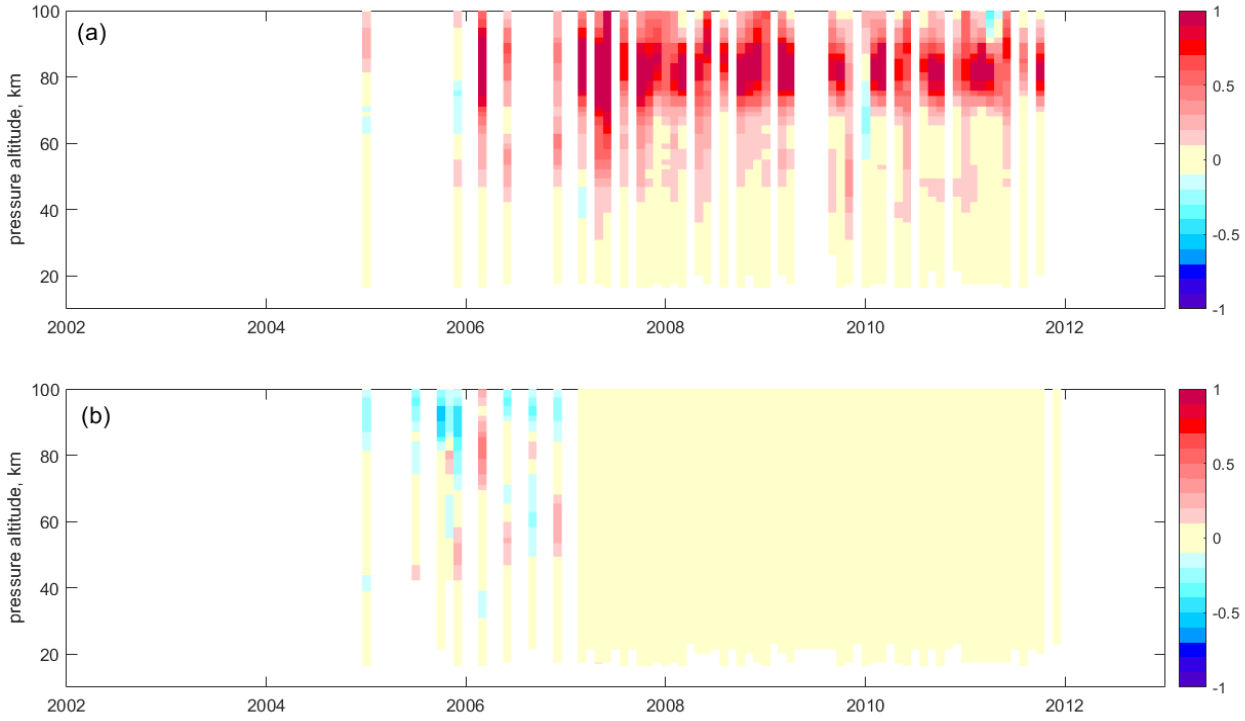

Figure S3: The time series of differences between GOMOS and MIPAS_MA_UA altitude (km) as a function of pressure altitude when (top) the original GOMOS pressure-altitude relation is used and (bottom) when the MIPAS_MA_UA altitude-pressure relation is used.

3. Ozone trends in absolute values

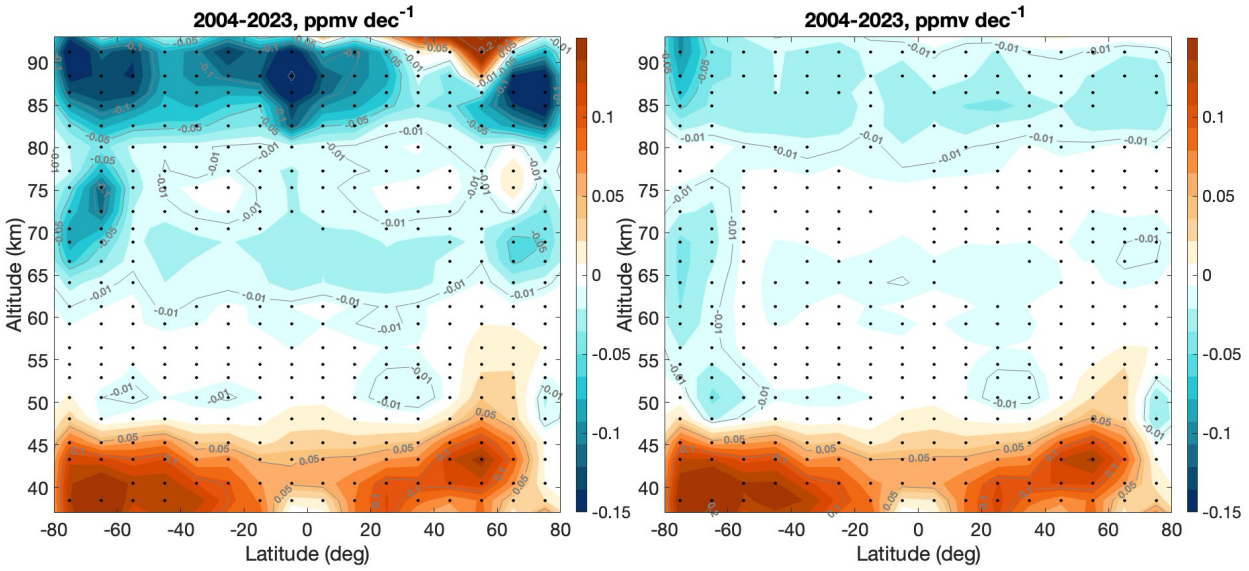

Figure S4: Latitude-altitude variation of ozone trends derived from the METEOR-O_3 dataset. Trends are calculated over 2004-2023 for night (left panel) and day (right panel). The black dots denote trends that are not statistically significant at the 95% confidence level. Trends are given in ppmv per decade. Contour spacing is 0.05 ppmv.