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On seasonality of stratomesospheric CO above midlatitudes: New insight from solar FTIR spectrometry at Zugspitze and Garmisch

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Stratomesospheric CO is an ideal tracer for the global transport in the middle atmosphere. This transport is part of a complex mechanism, i.e., photochemistry produces more CO in summer than in winter, and horizontal transport through the meridional circulation enhances CO abundances in the winter thermosphere. Subsequent downward transport by vertical advection then greatly enhances the CO mixing ratios in the winter stratomesosphere relative to the summer, because of reduced OH densities in winter [*Solomon et al.*, 1985].

Already the study by *Solomon et al.* [1985] called for a continuous observation program of stratomesospheric CO at mid-latitudes to better understand the transport processes in the middle atmosphere. However, this could not be realized until now.

This study i) fills the lack of long term observations at mid-latitudes with 10 years of continuous measurements above the mid-latitude NDACC stations Zugspitze and Garmisch, ii) presents a new FTIR retrieval approach for CO above 24 km applicable to all mid-latitude stations, iii) derives a significant seasonality with a seasonality factor of 2.2 relative to the summer background which agrees to WACCM calculations, iv) proves that WACCM is not able to reflect the real year-to-year variability at mid-latitudes (R = -0.13), v) identifies strong enhancements on the daily scale (up to 300 %) as meridional excursions of vortex air through mid-latitudes, and vi) derives first statistics of this vortex-air transport, which shows that winter mid-latitudes are seasonally affected by vortexborder air and only rarely by vortex-center air (with a duration of 1-3 days) [*Borsdorff and Sussmann*, 2009]. Due to our measurement-site location at 47.42°N we are able to detect both monthly-scale signatures of CO transport induced by meridional circulation and daily-scale effects due to vortex-air distortions.

References:

Solomon, S., R. R. Garcia, J. J. Olivero, R. M. Bevilacqua, P. R. Schwartz, R. T. Clancy, and D. O. Muhleman (1985), Photochemistry and transport of carbon monoxide in the middle atmosphere, J. Atmos. Sci., 42, 1072– 1083.

Borsdorff, T., and R. Sussmann (2009), On seasonality of stratomesospheric CO above midlatitudes: New insight from solar FTIR spectrometry at Zugspitze and Garmisch, Geophys. Res. Lett., 36, L21804, doi:10.1029/2009GL040056.