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Stratospheric hydrogen peroxide (H2O2): Comparison between MIPAS observations and KASIMA model results with focus on the SPE 2003

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H, OH and HO2 (collectively called HOx) are fast-reacting radicals in the middle atmosphere. These radicals are efficient catalysts for destroying ozone and play an important role in atmospheric chemistry. An important reservoir gas for HOx is Hydrogen Peroxide (H2O2). For all these important species at the moment only few measurements exist, e.g. in-situ measurements in the troposphere, balloon and rocket measurements, few HOx measurements by aircraft, and global satellite measurements of OH and HO2 by Aura/MLS since 2005. We present results for H2O2 for global day and night measurements with the MIPAS instrument on the ESA satellite ENVISAT.
We find is a strong annual cycle with high values for H2O2 in polar summer consitent with the strong coupling to HOx chemistry.

We investigated in more detail the Solar Proton Event (SPE) that occurred in October/November 2003. During SPEs, precipitation of energetic protons into the polar atmosphere produces ions in the middle atmosphere which form, partly via ion-cluster-reactions, odd hydrogen (HOx) and odd nitrogen (NOx). Increased levels of HOx and NOx, in turn, depletes the ozone in the polar stratosphere and mesosphere. We present the results of our retrievals of H2O2 for this event and compare the observations with results of the KASIMA model which has been upgraded to handle the ionization of the atmosphere due to the SPE and subsequent chemical reactions due to the NOx/HOx enhancements.