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Effects of solar particle events on the hydroxyl airglow layer

Holger Winkler (1), Christian von Savigny (2), and Jan Maik Wissing (3)

(1) Institute of Environmental Physics, University of Bremen, Germany (hwinkler@iup.physik.uni-bremen.de), (2) Institute of Physics, Ernst-Moritz-Arndt-University of Greifswald, Germany, (3) Fachbereich Physik, University of Osnabrück, Germany

The so-called Meinel emissions of vibrationally-rotationally excited hydroxyl molecules OH* near the mesopause are useful indicators for dynamical and chemical processes in this region. It is well established that the main source of OH* in the Earth's mesosphere is the reaction H + O_3 → OH* + O_2. During solar particle events (SPEs) energetic protons and electrons enter the polar atmosphere. The precipitating particles give rise to chemical perturbations. Of particular interest for the OH chemistry is the ion-chemical conversion of water molecules into H + OH. Additionally, there is SPE induced ozone loss. As the formation of OH* is dependent on O_3 and H, large SPEs are expected to affect the hydroxyl airglow layer. Additionally, the changed abundance of atomic oxygen will impact the quenching of OH*. In addition to the direct initial chemical composition changes, SPEs are known to affect temperatures, and in turn reaction rates coefficients.

We present satellite (SABER) observations of OH* emissions during the large SPE in October/November 2003. Preliminary results indicate significant disturbances of the OH* airglow layer, and a decrease in the OH* emission altitude. The measurement data are compared to results of model simulations. SPE effects on OH* are modelled by means of the UBIC (University of Bremen Ion Chemistry) model using SPE ionisation rates from AIMOS (Atmospheric Ionization Module Osnabrück). Temperature effects are accounted for by synthetic temperature disturbances as well as Aura-MLS measurements.