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A new ion rate dependent parameterization for HNO3 buildup on water cluster ions

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Nitric Acid (HNO_3) is one of the most important members of the odd nitrogen family NO_y and plays a major role in the formation of polar stratospheric clouds which are the key ingredient for the building of the ozone hole. Good knowledge of sources and sinks of HNO_3 is therefore essential for the understanding of stratospheric ozone chemistry. MIPAS satellite observations during the last years have shown that polar winter NO_y enhancements related to NO_x intrusions of mesospheric origin can cause buildup of additional HNO_3.

One of the main sources - in particular in the middle to upper winter stratosphere - is HNO_3 formation on water cluster ions and heterogenous reactions on sulfate aerosols (Böhringer et al. ,1983, de Zafra et al., 2001) transforming N_2O_5 into HNO_3. The parameterization by de Zafra et al. (2001) assumed constant water cluster ions profiles. In our CTM KASIMA we introduced a dependence of ionization rates and modified the original parameterization. Using the new parameterization we compare our model results to observations with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS). Largest effects are observed in timeperiods after NO_x enhancements in agreement with observations, but also effects of ionization by galactic cosmic radiation is found in the model.

References:

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