



Transport of nitrogen oxides ionized by energetic particle precipitation

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Energetic particles enter the atmosphere of the Earth in the polar region, where they cause the production of nitrogen oxides (NO_x). Magnetospheric energetic particles in general only reach the lower thermosphere, while solar protons penetrate into the stratosphere. It is supposed that during the polar night the NO_x can be transported downwards to the stratosphere, where they contribute to ozone depletion. This would affect the strength of the polar vortex, which in turn may influence the climate in the troposphere. However, it is still not clear which kind of transport causes the descent of NO_x into the stratosphere. Here, we analyze the transport of nitrogen oxides through the mesopause with the Hamburg Model of the Neutral and Ionized Atmosphere (HAMMONIA). We perform simulations with a passive tracer where single transport processes are switched off in order to assess their importance.

The transport of nitrogen oxides from the upper atmospheric levels downwards to the middle atmosphere is still a open question. This uncertainty propagates to the estimation of the processes which are influenced by the descending NO_x and finally to a possible influence on the climate.