



Mesospheric NO₂ production due to relativistic electron precipitation from 2007 till 2011

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Electrons of the radiation belts and the aurora can precipitate into the Earth's atmosphere. Depending on their energy they intrude into different altitudes and can excitate, ionize, and dissociate molecular nitrogen. Subsequent (ion-)chemical reactions result in an effective NO_x-production (NO_x=NO+NO₂). NO_x is produced mostly by auroral electrons in the thermosphere at ca. 110 km altitude. But relativistic electrons from the radiation belts can also reach the stratosphere. However, in the stratosphere and lower mesosphere, no direct NO_x-production due to electron precipitation has been detected yet.

We use NO₂ observations from the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) on Envisat in the altitude range from 40 km to 60 km in order to search for direct NO_x-production. We show that the AP index correlates with the nighttime NO₂ abundance between 44 km and 54 km altitude at 65±5°N geomagnetic latitude. At these altitudes the NO₂ ratio of nighttime NO_x is between 80 % and 100 %. Because of the correlation between AP index and nighttime NO₂, we conclude, that there is direct NO_x-production caused by relativistic electrons about 0.5 ppb at the most.