Chemical effects of electron precipitation – Modelled thermospheric nitric oxide

C. Sætre (1), J. Stadsnes (1), N. Østgaard (1), C. A. Barth (2), S. M. Bailey (3), G. Germany (4), and D. N. Baker (2)

(1) Department of Physics and Technology, University of Bergen, Norway, (2) Laboratory for Atmospheric and Space Physics, University of Colorado, USA, (3) Geophysical Institute, University of Alaska, USA, (4) Applied Physics Laboratory, Johns Hopkins University, USA (camilla.saetre@ift.uib.no / Fax: +47 55589440)

Nitric oxide in the lower thermosphere is significantly increased during auroral active periods. The precipitating energetic electrons ($\sim$keV) will excite and ionise atmospheric constituents causing enhanced nitric oxide density in the lower thermosphere. Nitric oxide at these altitudes has a lifetime of $\sim$1 day. The technique of measuring nitric oxide volume density from dayglow emissions will hence include the amounts of nitric oxide produced during the night from auroral electrons. The aim of this study is to develop a geographical map of the energy deposited by the precipitating electrons as a function of time. The electron energy deposition is described by the characteristic electron energy and the electron energy flux. These are derived from a combination of ultraviolet and X-ray bremsstrahlung measurements. The ultraviolet observations are from the Ultraviolet Imager (UVI), and the X-rays are observed by the Polar Ionospheric X-ray Imaging Experiment (PIXIE), both on the Polar spacecraft. The energy deposition may be used as input in a photochemical model of nitric oxide. We will present results where the modelled nitric oxide density is compared with the nitric oxide density measured on the dayside by the Student Nitric Oxide Explorer (SNOE). The events used in this study are from the beginning of two geomagnetic storms 2 May and 26 June 1998, where the auroral conditions one day prior to the storm onset were rather quiet. Thus the nitric oxide increase observed by SNOE is assumed not to be influenced by precipitation occurring before the UVI and PIXIE measurements for these two days.