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Spatio-temporal variations of NO_y species in the northern latitudes stratosphere measured with the balloon-borne MIPAS instrument

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Abstract. This paper presents the spatio-temporal distribution of NO_y species at altitudes between 14 and 31 km as measured with the MIPAS-B instrument on the morning of 21 March 2003 in northern Scandinavia. At lower altitudes (below about 22 km), temperature variations, the distribution of ClONO₂, and the tracer N₂O reveal the dynamics through the edge of the late arctic polar vortex. At higher altitudes, continuous measurement before, during, and after sunrise provides information about photochemistry illustrating the evolution of the photochemically active gases NO₂ and N₂O₅ around sunrise. The measured temporal evolution of NO₂ and N₂O₅ is compared to box modelling that is run along backward calculated trajectories. While the comparison of measured and modelled N₂O₅ reveals significant differences, there is a good agreement between the model and observations for NO₂ in terms of volume mixing ratios but the simulated decrease shortly after sunrise is underestimated compared to the measurements. The differences are attributed to the photolysis rates used in the box model calculations.

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