Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-198-RC2, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "A semi-empirical model for mesospheric and stratospheric NO_y produced by energetic particle precipitation" *by* Bernd Funke et al.

Anonymous Referee #2

Received and published: 18 April 2016

The paper presents an empirical model for EPP generated NOy fluxes based on MIPAS observations. It takes into account peturbed NH winters with an elevated stratopause. This model is of significant utility for low-lid chemistry climate models that do not capture EPP NOy formation.

The paper is well written and covers all the relevant details and citations. I recommend publication with minor revisions.

Minor comments:

1) The fit for ES states is based on only two winters. Even if both winters cover a significant amount of variance, they still may not be enough. Have the authors tried to

apply the fitting procedure to model data from CCMs that resolve EPP NOy fluxes and have more instances of major sudden stratospheric warming events? This should give some idea of how the fitting performs for observational data.

2) Figure 8 indicates that the empirical model overestimates EPP NOy at higher altitudes before the major sudden warming event. This overestimation appears in 2010 and 2011 in the NH and in 2008 and 2009 in the SH as well ((Fig. 3a,b). This seems to be related to the the transport time as shown in Figure 1 where the red and blue solid lines (corresponding to the expression used in the model) deviate from the best fit as shown by the open diamonds. What motivated the choice of the expression giving the solid lines shown instead of lines with a tighter fit above 0.3 hPa? Longer transport times are associated with higher concentrations of NOy due to slower flushing given a fixed rate of formation.

Technical comments:

p 26, l.3: that -> than

p 29, l.8-9: Ap is correlated with the solar wind which maximizes during the declining phase of the solar cycle.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-198, 2016.