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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Snow optical properties at Dome C, Antarctica – implications for snow emissions and snow chemistry of reactive nitrogen" *by* J. L. France et al.

Anonymous Referee #3

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The manuscript presents a photochemical model that describes the release of NO_2 from phot-decay of NO_3^- present in surface snow, using various solar zenith angles and rates of NO_3^- decay in a radiative transfer model for clear sky conditions. The focus of the study is on surface snow at Dome C, Antarctica: an important study area with regards to snow-boundary layer interactions and the regional formation of ozone, where the snowpack is considered to play a major role in the supply of ozone precursor compounds like NO_2.

The rationale, approach and objectives are sound, and in short the paper is very well written with an excellent set of figures to illustrate key data and findings. The inclusion

of measured data and the ensuing discussion comparing the model NO_2 fluxes with earlier measured data is both interesting and useful.

Comments

- The rate of nitrate photolysis is dependent on the quantum yield of photodegradation (Φ) and yet there is some uncertainty in this value, as raised by the authors (p11969). Did the authors therefore attempt a sensitivity analysis by varying values of Φ based on the range of lab-based measurements? Furthermore, is it likely that the model output (re: NO_2flux) will be strongly influenced by this parameter and, if so, do the range of model values e.g. min max lines in Fig 5, reflect different Φ.
- Figure 6. The figure legend describes dotted lines to illustrate the min max NO_2 fluxes, but these aren't present on the figure (not in my PDF version anyway).

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 11959, 2011.