

Interactive  
Comment

## ***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  $\text{NO}_2$  from phot-decay of  $\text{NO}_3^-$  present in surface snow, using various solar zenith angles and rates of  $\text{NO}_3^-$  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  $\text{NO}_2$ .

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

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of measured data and the ensuing discussion comparing the model NO<sub>2</sub> fluxes with earlier measured data is both interesting and useful.

## Comments

- The rate of nitrate photolysis is dependent on the quantum yield of photodegradation ( $\Phi$ ) 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  $\Phi$  based on the range of lab-based measurements? Furthermore, is it likely that the model output (re: NO<sub>2</sub>flux) 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  $\Phi$ .
- Figure 6. The figure legend describes dotted lines to illustrate the min max NO<sub>2</sub> fluxes, but these aren't present on the figure (not in my PDF version anyway).

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

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