Atmospheric
Chemistry
and Physics
Discussions

Open Access

Interactive comment on "Air–snow exchange of nitrate: a modelling approach to investigate physicochemical processes in surface snow at Dome C, Antarctica" *by* Josué Bock et al.

Anonymous Referee #1

Received and published: 7 April 2016

Bock et al. use a model to examine the impacts of the physical exchange processes, adsorption, bulk diffusion and co-condensation, on the depth profiles of nitrate concentration in snow at Dome C, Antarctica. They find that bulk diffusion and co-condensation alone can explain the observed profiles.

This paper was not clearly written and thus very frustrating to read. I don't understand how one can model snow nitrate without including important processes such as atmospheric deposition and the photolysis of snow nitrate. The former is how nitrate gets to the snow in the first place, and the latter has been shown to be the dominant loss process of snow nitrate at Dome C. Although I agree that their study is important, as such physical processes will influence the distribution of nitrate in the snow column and

the snow grain, the latter of which may influence e.g., how photolabile snow nitrate is, I don't see how they can ignore these other important processes. It seems that it would be better to use their model to examine the results in a laboratory, where the processes they ignore can be controlled.

Since the manuscript is not clearly written, it is possible that I am misunderstanding something important about their modeling framework.