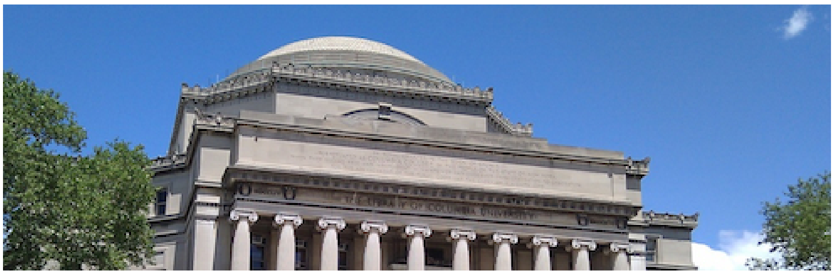

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Investigating the Impact of Snowpack Photodenitrification on Antarctic Atmospheric Chemistry Utilizing Results from a Snowpack Radiative Transfer Model in a Global Chemical Transport Model

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The photolysis of nitrate (NO3-) in snowpack is a source of NOx to the overlying atmosphere, with implications for the oxidizing capacity of polar atmospheres and the preservation of chemicals in the ice core record. A snowpack radiative transfer model with updated optical properties in the UV [Warren and Clarke, 2008] leads to an e-folding depth of actinic flux in snowpack of 60 cm [Grenfell, 1991]. The snowpack radiative transfer model is used to determine the vertical profile of actinic flux in Antarctic snowpack at South Pole, Dome C, and Neumayer. The NOx ventilation depth in snowpack is determined by comparing the ventilation lifetime of NO2 out of the snowpack by diffusion and wind pumping to the chemical lifetime of NO2 in the snowpack. Chemical sinks for NO2 in the snowpack include conversion to HNO3, BrNO3 and INO3. Below the ventilation depth, 42 ± 27 cm at South Pole, 38 ± 11cm at Dome C, and 34 ± 26 cm at Neumayer, Antarctica, the NOx produced through NO3- photolysis does not escape into the atmosphere. Preliminary results of this study show that photodenitrification can occur tens of centimeters deeper in the snowpack than previously determined. The flux of NOx from South Pole (1.4-4.4E8 molec cm-2 s-1) and Neumayer (1.2-3.9E8 molec cm-2 s-1) snowpacks are computed and are in good agreement with observed NOx fluxes at South Pole (2.2-3.9E8 molec cm-2 s-1) and Neumayer (1.3-2.5E8 molec cm-2 s-1). The results of this study will be used in a global chemical transport model, GEOS-Chem, to estimate the impacts of snowpack photodenitrification on polar nitrogen budgets.

Please list some keywords

snowpack photodenitrification, Antarctica, e-folding depth, ventilation depth, NOx flux, GEOS-Chem

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