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ABSTRACT

The impact of nitrogen chemistry in snow on atmospheric oxidising capacity under modern and past climate change

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Snow photochemical processes drive production of chemical trace gases and radicals in snowpacks which are then released to the lower atmosphere. These gases and radicals were found have significant impacts on the oxidizing capacity in the troposphere by altering concentration of ozone, a pollutant and greenhouse gas, and of the hydroxyl radical (OH), which is responsible for the removal of many atmospheric pollutants. The changes of atmospheric ozone in turn can influence the regional energy balance and climate, where as OH controls the build up other green house gases. Climate models predict the largest temperature rise in the polar regions, with concurrent changes in physicochemical properties of snowpacks almost certainly affecting the chemical snow source.

In the Arctic, there is strong interest in near-term mitigation of the current warming by controlling short-lived climate forcers such as tropospheric ozone. The main contributions of Arctic ozone are from oxidized nitrogen emission in North America and shipping in the Arctic. However, the snow source of nitrogen oxides is expected to play, in some regions, an important role and therefore needs to be included in any tropospheric ozone budget analysis to assess the success of reductions in anthropogenic emission of ozone precursors.

The regional and global impact of these snow emissions has not been quantified yet. The aim of this project is to develop a quantitative coupled atmosphere-snowpack models to 1) evaluate the impact of snow photochemistry at present and in the past climate change and 2) predict the influence of increasing anthropogenic emission and rising temperature to nitrogen oxide emission form snow.