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Investigation of boundary layer photochemistry at the WAIS-Divide site through measurement of major photochemically active species in snow and air

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Interactions between the polar snowpack and the overlying troposphere impact boundary-layer photochemistry and preservation of deposited atmospheric chemical species in snow. The potential of the polar snowpack to act as an H2O2 reservoir and its potential to emit NOx (NO+NO2) from nitrate photolysis in the near-surface snowpack were recently suggested as important factors in altering the oxidative composition of the lower portion of the overlying troposphere.
Measurements of major photochemically active species: nitric oxide (NO), ozone (O3), hydrogen peroxide (H2O2), nitrate (NO3-) were made during the 08-09 WAIS-Divide campaign. Overall values were in the range of those measured above the West Antarctic Ice Sheet during the ITASE traverses. Measured NO levels confirmed those estimated by previous photochemical box model runs (Frey et al., 2005).
Assuming a boundary-layer height of 100 m, we estimated a NOx flux from the snowpack and compared the result with our atmospheric record. We found that NOx emission from the snowpack contributes to up to 40% of the atmospheric nitric oxide at the WAIS-Divide site. Observed specific ozone events at WAIS Divide and at South Pole combined with back-trajectory analyses suggest that outflows from the East Antarctic Plateau also significantly impact the boundary-layer chemical composition at WAIS Divide.

Please list some keywords

Photochemistry; Antarctica; WAIS-Divide; NOx; NO3; H2O2; Ozone; Snow emissions; Troposphere

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