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Relationship between NO, NO_2, HONO, and HNO_3 Fluxes above Snow Surfaces at Ny-Ålesund, Svalbard (Arctic)

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Deposition of NO_3^- in and on snow surfaces is not the final sink for atmospheric N-species; nitrates can be photochemically re-activated in the snow; this leads to the release of the more reactive species NO, NO_2, and HONO back into the atmosphere.

Surface flux measurements of HONO, HNO_3, NO and NO_2 were made above the snow surface near the Italian Station "Dirigibile Italia" at the Kongsfjorden International Research Base at Ny-Ålesund, Svalbard (79˚N), between February 20, 2006 and April 20, 2006. Median mixing ratios were observed for NO of 1.6 pmol mol^{-1}(changing with available sunlight), for $NO_2$of 5.8 pmol mol^{-1}, for HONO of 13.2 pmol mol^{-1}, and for $HNO_3$of 19.8 pmol mol^{-1}. During a few defined episodes the maximum fluxes observed were 40 nmol m^{-2} h^{-1} for HONO, 50 and 150 nmol m^{-2} h^{-1} for NO and NO_2, respectively, and -350 nmol m^{-2} h^{-1} for HNO_3. However, for the most part the fluxes were much smaller at this Arctic marine site, in accord with earlier observations.

These observations help us understand the nitrogen exchange processes between snow surfaces and the atmosphere. In this work we explore the chemical and physical snow and light conditions necessary for NOx and HONO release.