

Bromine activation on super-micron aerosols in the Canadian high Arctic

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Bromine explosions in the Arctic springtime are responsible for frequent and almost complete destruction of near-surface ozone. The sources of reactive bromine are the snowpack and aerosols, but the exact conditions and mechanisms required for bromine release are not well understood. Sea salt aerosol formed from sublimation of blowing snow likely plays a role in recycling and releasing bromine in the atmosphere. Direct observation of bromine chemistry on aerosols, however, is challenging. Here we present bromine monoxide (BrO) profiles retrieved from Multi-AXis Differential Optical Absorption Spectroscopy (MAX-DOAS) measurements alongside in-situ aerosol measurements from Eureka, Nunavut, Canada (80.1° N, 86.4° W). Comparison of BrO partial columns to super-micron aerosol concentrations reveals that bromine enhancement is correlated with high aerosol concentrations in the measurement period (2016-2018). These particles are likely sea salt aerosol particles that formed locally. Estimates of aerosol bromine content and heterogeneous reaction rates indicate that the aerosols might contain enough bromine to explain the observed BrO concentrations. We see no correlation between BrO and sub-micron aerosols (pollution transported from northern Eurasia), although these particles might also participate in bromine recycling. BrO profiles from MAX-DOAS measurements are also compared to modelled BrO concentrations from the UKCA global chemistry-climate model.