Ozone Depletion in the Arctic Spring-time
The lifecycle of bromine

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Tropospheric ozone is after carbon dioxide and methane the most important greenhouse gas and affects air quality with implications for health and ecosystems. During spring-time in the polar regions of both hemispheres tropospheric **ozone depletion events (ODEs)** with near complete removal of boundary layer ozone are frequently observed. These ODEs are caused by so-called **bromine explosion events (BEEs)**, that can be observed from satellites as **strongly enhanced tropospheric bromine monoxide (BrO) column densities**. There is still no generally accepted comprehensive mechanism of BEEs and consequently most chemistry climate models (CCMs) do not include mechanisms of polar tropospheric bromine chemistry.

It is widely accepted that **heterogeneous chemistry** in salty snow and on aerosols play key roles in sustaining BEEs. Models that include Arctic bromine chemistry assume either an **infinite source or bromide** in snow or **deposition** of inorganic bromine **from the gas-phase**. However, the major source of bromine in the Arctic is the Ocean. Be it directly in form of **sea salt** or indirectly from **biogenic activity of algae** that live on the water-ice interface. A better understanding of the **spatio-temporal distribution of bromine** from these sources will improve the predictability of ODEs.

Research question
Emission and deposition of sea salt & bromine in the Arctic

ART

Good to know
- ✔ Data analysis with python (xarray, pandas, numpy)
- ✔ High Performance Computing (bash, FORTRAN)
- ✔ Atmospheric boundary layer dynamics
- ✔ Atmospheric chemistry in cold environments

Data & tools
- ■ Analyze CCM experiments (ECHAM/MESSy) and/or
- ■ Conduct high. res. regional model experiments (ICON-ART)
- ■ Evaluate with snow samples from Ny-Ålesund (Spitzbergen)
- ■ Study spatio-temporal correlations