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Tropospheric polar BrO derived from S5-P/TROPOMI

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Halogen radicals can drastically alter the atmospheric chemistry. In the polar regions, this is made evident by the ozone desctruction in the stratosphere (ozone hole) but also by localized destruction of boundary layer ozone during polar springs. These recurrent episodes of catalytic ozone depletion are caused by enhanced concentrations of reactive bromine compounds. The proposed mechanism by which these are released into the atmosphere is called bromine explosion - reactive bromine is formed autocatalytically from the condensed phase.

The spatial resolution of S-5P/TROPOMI of up to 3,5 km x 5.5 km² allows improved localization and a finer specification of these events compared to previous satellite measurements. Together with the better than daily coverage over the polar regions, this allows investigations of the spatiotemporal variability of enhanced BrO levels and their relation to different possible bromine sources and release mechanisms.

Here, we present tropospheric BrO column densities retrieved from TROPOMI measurements using Differential Optical Absorption Spectroscopy (DOAS). We developed an algorithm capable of separating tropospheric and stratospheric partial columns without further external (model) input only relying on measured $NO_2$and O_3, by utilizing a modified version of a k-means clustering and other methods from statistical data analysis.

Selected events from the polar springs in 2019 and 2020 are further analyzed and discussed with regards to sea ice coverage and meteorological influences.