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Vertical concentration profiles of halogen species, e.g. BrO, making use of the MAX-DOAS technique at Villum Research Station (North Greenland)

Nuria Benavent, David Garcia-Nieto, Carlos Alberto Cuevas Rodríguez, and Alfonso Saiz-Lopez

Instituto de Química Física Rocasolano. Consejo Superior de Investigaciones Científicas (CSIC), Química Atmosférica y Clima, Madrid, Spai

In the past decades, atmospheric chemists have come to realize that halogen species (like Cl, Br or I and their oxides ClO, BrO and IO) exert a powerful influence on the chemical composition of the troposphere and through that influence affect the evolution of pollutants, hence having a significant impact on climate. These reactive halogen species are potent oxidizers for organic and inorganic compounds throughout the troposphere. In particular, halogen cycles can act on several compounds (such as methane, ozone, particles...), all of which are climate forcing agents through direct and indirect radiative effects.
Strong and sudden increases in reactive bromine were observed in the Arctic and Antarctic marine boundary layer during their respective springtime. This bromine increase is known as "bromine explosion" and it is caused by autocatalytic processes on sea salt surfaces (similar to those that occur in the stratosphere). This phenomenon often leads to the complete destruction of near surface ozone.
For these reasons it is important to study them. In order to do this, we built a MAX-DOAS (Multi-AXis DOAS) instrument which has been installed at Villum Research Station -Station Nord, 81°36 N, 16°40W- last April. The DOAS (Differential Optical Absorption Spectroscopy) technique is based on the isolation of the narrowband features that trace gases possess in their spectral absorption coefficients. Using this method it is possible to determine concentration profiles of these reactive halogens species. Since the MAX-DOAS instrument collects scattered sunlight it works continuously as long as there is sunlight, allowing long-term analysis. In particular vertical concentration profiles of BrO have been retrieved.