Geophysical Research Abstracts, Vol. 9, 08530, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08530

Long term ground-based observations reveal a recent decline in stratospheric bromine loading

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Total stratospheric columns of bromine monoxide (BrO) have been monitored by UV-visible differential absorption spectroscopy since 1994 at two stations of the Network for the Detection of Atmospheric Composition Changes (NDACC): Harestua, Southern Norway (60°N, 11°E) and Lauder, New-Zealand (45°S, 170°S). Through adoption of a common set of analysis parameters and reference cross-section spectra, consolidated and homogenized time series of BrO column measurements have been created in both locations over the period from 1995 until mid-2006. Based on these data sets, the long-term evolution of the stratospheric bromine content is investigated. After correction for the strong photochemically-induced seasonal variation of BrO, measured columns are found to increase during the late nineties, stabilize around 2000 and subsequently decrease after 2004. Excluding major changes in aerosol or nitrogen oxide content that may otherwise have affected the bromine partitioning, our observations provide the first clear evidence for a decline of the stratospheric bromine loading, presumably in response to international protocols that have been introduced during the nineties to limit the production of brominated source gases. Accounting for the 5-years delay needed to transport air masses from the surface to the stratosphere, the observed decline is consistent with the reported trend of brominated sources. These results suggest that the evolution of inorganic bromine in the stratosphere closely follows the tropospheric change that results primarily from changes in anthropogenic emissions of CH3Br and the halons.