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Ground-based DOAS observations of stratospheric O_3, NO_2, BrO and OClO at two different Antarctic sites

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BrO and OClO are two of the most important halogen radicals involved in the ozone destruction. Although chlorine dioxide (OClO) does not participate directly in the destruction of ozone, observations of OClO are a good indicator for chlorine activation in the polar vortex based on the assumption of OClO concentration is linearly dependent on the ClO concentration. Accurate measurements of both components (BrO, OClO) are important to understand the halogen chemistry in the highly perturbed spring atmosphere in the polar regions, especially in Antarctica, where BrO and OClO ground-based measurements are very sparse and satellite observations have some limitations.

Ground-based MAXDOAS observations were performed at Belgrano (78ºS) and Marambio (64ºS) by IAA/INTA during 2015. Stations are located close in longitude but separated 14º in latitude. Belgrano is representative of an in-polar vortex station during the winter-spring season until the vortex breakdown, while Marambio is frequently located in the edge region of the vortex.
Simultaneous measurements of halogen species in both stations, using the same kind of instrumentation developed at INTA, are key factor to characterize the distribution of halogens, ozone and NO_2 in two different although close scenarios and, also, to get a better understanding of the mechanisms that release halogens into the atmosphere.

We report on the UV/Vis spectroscopic measurements performed during 2015 showing stratospheric BrO, OClO, NO_2 and O_3 above both stations. We present the seasonal evolution of these gases, as well as their role in the ozone depletion observed during the austral spring. The south polar vortex of 2015 was unusually stable and long-lived, so ozone depletion lasted longer than seen in recent years. A detailed analysis of the heat flux and of the position of the stations with respect to the polar vortex will be presented using equivalent latitude al 550 and 475 K isentropic levels.