Introduction

- Reactive halogen species (containing Cl, Br or I) are important reactants in both the stratosphere and the troposphere. [1] Breon monoxide (BrO) and chlorine dioxide (ClO2) are efficient catalysts of the ozone (O3) destruction in the lower stratosphere and both bromine monoxide and iodine monoxide (IO) have been clearly identified as responsible for ozone depletion events (ODEs) in polar boundary layer during springtime [1]. Accurate measurements of these compounds in addition to those of nitrogen dioxide (NO2) are relevant to understand the halogen chemistry in the highly perturbed spring atmosphere in the polar regions, especially in Antarctica, where halogen ground-based measurements are very sparse and satellite observations have limitations.

- This work presents ground-based observations performed between 2015 at Belgrano (53°S) and at Marambio (67°S). Both measurement stations are located in the edge region of the vortex (Fig. 1). Measurements of halogen species from both stations, using the same kind of instrument development at INTA (Fig. 2), will contribute to the characterization of the vertical distribution and seasonality of halogen, ozone and NO2 in two different although close scenarios and to get a better understanding of the mechanisms releasing halogens into the polar atmosphere.

- Tropospheric measurements were performed during a daily basis when the Solar Zenith Angle is below 70°. [2] Diffuse solar skylight is collected at a selected elevation angles over the horizon. [3] Instrument elevation angles: 0°, 15°, 30°, 45°, 60°, 75°.

- Total time for a cycle: 3 minutes.

- Pointing system is basically mechanically and electronically developed and built at INTA with the support of PDV.

Stratospheric Observations during 2015

- Tropospheric BrO and IO measurements in the Antarctic are performed using a dual-axis differential optical absorption spectrometer (DADS). The system has been successfully used in this region to monitor stratospheric compositions. [4-6]

- Stratospheric BrO and IO are measured daily in the Antarctic. The Raman measurements are performed at a zenith angle of 25°, 45°, 60° and 75°. The NO2 column is measured at 1 hour along the day with a zenith angle of 70°. The NO2 columns are measured at 25°, 45°, 60° and 75°.

- The preliminary data are shown in Fig. 6. Figure 7 shows a zoom of the NO2 observations at Belgrano including measurements of superscript oxides as an example of ozone depletion event [7, 8].

Summary and Future Work

- We present ground-based observations of stratospheric NO2, O3, BrO and IO of tropospheric BrO and IO. The measurements were performed during 2015 from two different Antarctic stations (Marambio and Belgrano).

- Results show the expected influence of the meteorological conditions and seasonal sea ice coverage characterizing the location of each station towards the observed chemical compounds.

- Tropospheric measurements show the impact of the Arctic and the Antarctic on the chemistry of the atmosphere.

- Future work includes, among others, the study of the impact of the Arctic on the chemistry of the atmosphere.

References