

QOS2016-94, 2016

Quadrennial Ozone Symposium of the International Ozone Commission

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Study of the vertical structure of tropospheric ozone depletion events at the coastal Antarctic Station of Belgrano (78°S, 35°W)

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Belgrano (78°S, 35°W) is an Antarctic coastal station lying approximately 20 km from the Weddell Sea coast and located 30 m above the sea level. A UV photometric ozone analyzer was deployed in 2007 with the double purpose of, quality control of ozone sounding launching at the same site and, background ozone monitoring in a long-term basis.

Eight years data record (2007-2014) have been used to analyze the seasonal cycle of surface ozone showing a winter maximum in July, and a summer minimum in January. Larger day to day fluctuations take place after the polar night, in agreement with other coastal Antarctic stations. At coastal sites such as Belgrano, surface ozone measurements during springtime exhibit massive occasional departures from the seasonal mean. Ozone Depletion Events (ODEs) observed are attributable to photochemical catalyzed ozone depletion from halogen chemistry, predominantly involving bromine. During those days, the ozone mixing ratio dropped until only a few ppbv in a short period of time.

Ozonesondes are launched at Belgrano since 1999 and for the study period, 292 have been launched, with a higher frequency from August to November every year. Surface ozone data from the ozonesondes and surface ozone analyzer data have been compared for the eight years period. A good agreement is observed between both types of instruments. In particular, low ozone episodes are captured by both techniques showing the genuine character of the events. The ozone vertical profiles allow to characterize the vertical structure of these episodes and to quantify the ozone destruction in the region.

The vertical structure of 19 ODEs captured by ozonesondes at Belgrano station have been studied in detail and presented in this work. The vertical structure of the studied ODEs is dependent of transport mechanism. Its vertical extension is highly variable, oscillating between 800 and 3200 m. An increment of the vertical extent of the ODE is observed by the end of the ODE season. The ozone destruction in DU per km for each event has been quantified giving a mean value of 1.2 DU/km.