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Ozone and carbon monoxide at the Ushuaia GAW-WMO global station

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Ozone and carbon monoxide have been investigated in the GAW-WMO station of Ushuaia (Argentina), using hourly values during five years (2010-2014). This work has been developed in the framework of HELADO (Halogens in the Antarctic atmosphere and its role in the Ozone distribution) project and under the collaboration between INTA (National Institute for Aerospace Technology - Spain), SMN (National Meteorological Service - Argentina) and AEMET (State Meteorological Agency – Spain). Meteorological features have been analyzed with in-situ observations and meteorological fields from ECMWF 0.5° as spatial resolution model. These fields have been applied to compute back trajectories with HYSPLIT model. Independently of season, mostly atmospheric flows coming from W-SW (South Pacific Ocean), theses westerlies winds are associated with low pressure systems; in addition with lower frequencies are collected winds from South (Antarctic Peninsula and Weddell Sea), polar easterlies. Hourly averages of surface (in-situ) ozone and CO levels were 20±7 and 71±45 ppb respectively, typical values of remote environments. A clear seasonal pattern has been obtained for surface ozone with monthly peaks in winter of 25 ppb and minimum in summer with 12 ppb; a similar behaviour is found for CO, 93 and 48 ppb for maximum and minimum values, respectively. A weak daily cycle has been obtained in both species, amplitude for ozone of 2-4 ppb and 13-20 ppb for CO. The seasonal levels behaviour for surface ozone is also observed in upper levels, approximately from surface up to 5 km. This result has been obtained from 139 ozone profiles launched in the studied period. Since the ozone precursors and carbon monoxide emissions are low in this area, the origin of the values observed could be in the atmospheric transport processes. As hypothesis to explain the behaviour observed, we suggest that in the warm season with solar radiation, the photochemical mechanisms are active, and the elimination processes, playing an important role of halogenated species, are more efficient than the transport. Then, a decrease in ozone and CO is observed. In cold season, with low solar radiation and thermal inversions, ozone and CO show background levels higher than in warm season. These results point out that ozone values measured at Ushuaia could be representative of the South Pacific low-middle troposphere (approximately from 40^0S to 60^0S and from 70^0W to 120^0W).