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Evaluation of total ozone recovery inside the Antarctic vortex

A. Pazmino (1), S. Godin-Beekmann (1), A. Hauchecorne (1), C. Claud (2), F. Lefèvre (1), S. Khaykin (1), F. Goutail (1), J.P. Pommereau (1), C. Boone (3), E. Wolfram (4), J. Salvador (4), and E. Quel (4)

(1) LATMOS/IPSL, UVSQ Université Paris-Saclay, UPMC Univ. Paris 06, CNRS, Guyancourt, France

(andrea.pazmino@latmos.ipsl.fr), (2) LMD/IPSL, CNRS and Ecole Polytechnique, Université Paris-Saclay, Palaiseau, France,

(3) IPSL, CNRS, UPMC Univ. Paris 06, France, (4) CEILAP-UNIDEF (MINDEF-CONICET), Argentina

The latest assessment report on the state of the ozone layer (WMO 2014) confirmed the stabilization of the ozone loss in Antarctica since 2000. Several studies have been made in order to quantify the increase in total ozone column (TOC) in the Antarctic polar vortex in spring directly linked to the small decrease of ozone depleting substances levels in the polar stratosphere. These studies generally show a significant increase of TOC averaged inside the vortex since 2000 but they differ on the proxies used for the quantification of ozone interannual variability.

In this study, the trend of TOC inside the vortex is analyzed over the 1980-2015 period using multilinear regression model based on various proxies (heat flux, QBO, solar flux, AAO and aerosols). The ozone trend is simulated by a piecewise linear trend (PWLT) before and after the break year in 2000, corresponding to the change of slope in ozone long-term evolution. The originality of this study is to take into account the baroclinicity of the vortex. For this, two different methods are used to classify TOC values inside the vortex as a function of Equivalent Latitude (EL). In the first standard one, the Nash criterion (Nash et al., 1996) is applied at a single isentropic level (475K or 550K). In the second one it is applied to a range of isentropic levels between 400K and 600K with a step of 25K.

The study is focused on the period September 15 - October 15, the most representative of low ozone levels inside the vortex. The trend model is applied to SAOZ UV-Vis spectrometer data at Dumont d'Urville (66.7°S, 140°E) and also to TOMS/OMI above Antarctica and the trend results are presented for the different classification methods.

References

Nash et al., An objective determination of the polar vortex using Ertel's potential vorticity, *J. Geophys. Res.*, 101, 9471–9478, 1996.

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