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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Antarctic ozone variability inside the Polar Vortex estimated from balloon measurements" *by* M. C. Parrondo et al.

Anonymous Referee #2

Received and published: 8 August 2013

General comments

In this manuscript the authors present and discuss a 13 year record of ozonesonde data from the Antarctic station Belgrano with main focus on the ozone loss season. The Belgrano data set is one of few ozonesonde data sets in the Antarctic, which cover a long time period. Therefore, the data set and a corresponding publication is of high interest. The present manuscript mainly describes features. However, the corresponding discussions often end in vague statements. In addition one can find many inaccuracies, which have to be fixed.

It might be valuable to extend section 4.4 by a discussion of regions I and III. In total I recommend publication in ACP after addressing the following issues.

Comments

At page 15671+, lines 28+, the effect of ozone depleted air masses transported to higher latitudes is mentioned. However, this argument is seldom or not at all used in later discussions, e.g. when reduced ozone values are measured at SPS before the sun light period. The knowledge of the Eulerian view of station data and the corresponding specific differences between Belgrano and SPS are helpful in interpreting the data and have in general to be discussed much more.

Page 15670, Lines 10-15: How can the lowering in the height of the maximum at 20 or 22 km be influenced by chemistry in the 25-38 km region above?

p 15673, l 4-7: The contribution of the 2002 event to the variability is largest in region III. Therefore, I assume that the explanation dealing with minor warmings is less important.

Minor comments

Some of the figures, at least Figs. 2 and 3 have presentation problems. In those two figures the data (isolines) at the right border should coincide with the data at the left border, which is in fact not the case. In addition, the numbering of the isolines in the upper panel of Fig. 2 mismatch with the numbers of the colour legend on the right side, at least for the number 14. These problems may cause some of the following comments.

p 15665, l 12+: I recommend to acknowledge the first article dealing with this issue: Thompson and Solomon, Science 296, 895, 2002, DOI: 10.1126/science.1069270.

p 15668, l 3+: Are there any known biases between the different references?

p 15668, l 15-17: I understand that one profile per year, i.e. 13 profiles in total, contributes to the mean minimum profile. The time of a minimum in a single season can be altitude dependant. What was the definition of a minimum profile in a single season?

p 15670, l 8: I see the maximum at 20 km not at 22 km in January.

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p 15670, l 10-15: How can the lowering in the height of the maximum at 20 or 22 km be influenced by chemistry in the 25-38 km region?

p 15670, l 15: The rather large range of 3-7 km of descent is due to a height dependance. I recommend to compare the values in the same relavant height region.

p 15671, l 7-8: Please make more clear that the downward propagation rate as well as the end time is your result (and not that of Miyazaki et al.). Please specify the time period, where the downward propagation was 74 m per day.

p 15671, l 12-13: I don't understand the need and significance in mentioning "covering a 58% of the ..."

p 15672, l 12: The approx. height of 475 K is dependant on season. During the vortex season as it is of interest here, the approx. height is higher up, presumably 19-20 km.

p 15672, section 4.3: The definition of the ozone loss rate should be given in detail. Obviously, means are taken and plotted. This should be mentioned in the text and in the caption of the Fig. 4. What are the time periods where the means are taken? Why should relative ozone reductions be interesting to show??

p 15675, 13-14 & Fig. 8: Obviously different time periods are chosen to define ozone loss rates at Belgrano and SPS. Please specify.

p 15675, l 18: Too small for what??

p 15676, l 2: Man-made compounds like CFCs and halons are called ODS. However, the reservoir gases like HCl and ClONO2 and Clx are not named ODS. Please substitute "ODS" by "chlorine".

Technical issues

p 15664, l 14: "warm" instead of "warms"

p 15664, l 25: "longest vortex": I aasume longest in time. Please specify.

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p 15665, l 2: "mid 1980s" instead of "late 1980s"

p 15666, l 16: "both polar vortices": I assume the Antarctic and the Arctic polar vortices are meant. Please mention the word Arctic.

p 15667, l 5-7: "... of 2 profiles per month during summer and autumn and up to 6-10 profiles per month in winter and spring on Wednesdays ..." instead of "... of 2 profiles per month during summer and autumn months and up to 6-10 profiles in winter and spring months on Wednesdays ..."

p 15670, l 12: "Bhrul"?

p 15670, l 19: "evolution during summer" instead of "evolution summer"

p 15671, l 15: "rate of about" instead of "rate about"

p 15672, l 21: "in the coldest" instead of "in coldest"

p 15672, l 26-27: "details on inter-annual variability of the ozone loss rate can" instead of "details on ozone loss rate inter-annual variability can"

p 15675, l 1: "in the rate of" instead of "in rate of"

p 15677, l 22 "mean rate of about" instead of "mean rate about".

Figs. 4 and 5: Mention the corresponding phase in the captions.

Fig. 4: "with respect to ozone in" instead of "with respect the ozone in".

Fig. 7: Mention in the caption that the 2002 event was excluded for the calculation of the correlation.

Figs. 8 and 10: Why are there boxes around the plot symbols of South Pole data (upper left corner) and of PV criterium (lower right corner), respectively?

Fig. 9: "590 hours" can be placed nearer to days 275-280.

In my printed version of the manuscript some figures show one or more thin horizontal

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lines, which are not visible in the online and PDF versions.

Recommended phrasing:

p 15673, l 16-17: "In year 2010 ozone loss rate ... top layer it is even positive." instead of "Year 2010 is also an interesting case. Ozone loss rate ... top layer is even positive."

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 15663, 2013.