

Response to anonymous referee #2

Dear referee,

We greatly acknowledge your helpful comments and suggestions. Below we present the detailed replies to each comment. All modifications are written in red in the revised manuscript.

Minor points:

1. Par. 2.2

You use the DIAMOND model that contains only the isentropic transport. On the other side the cross-isentropic transport is also implemented in form of the diabatic heating rates. In total, you have a full 3d transport that is certainly more than the DIAMOND model. ...so maybe “extended version of the DIAMOND” model describes better your approach.

➤ This precision has been added.

2. Table 1

It would be also desirable to list in Table 1 the integrated ozone loss (in Dobson units) for both considered regions. This would quantify the respective contributions to the column ozone loss and is for me a more reliable (or more comparable) quantity than the mean ozone loss

➤ The column ozone change in DU has been added to table 1, as an additional information, in order to make the comparison with other studies easier. However, it is important to keep in mind that the integrated O3 loss values also depends on the size of the vortex area, that can be different from one year to another. This integrated quantity is not suited to study the composite of several winter seasons, as done in Sect. 5. For the sake of consistency, we have decided to keep our discussion based on the vmr quantity in the whole paper.

3. Table 1, caption

..., value of the maximum loss and the corresponding date

➤ This has been corrected.

4. P5 L28

1th April

➤ “1 April” has been changed to “1st April”. For the sake of consistency, all dates have been written using the same format.

5. P5 L33

“3” typo

➤ This has been corrected.

6. P6 L14

..in magnitude to the typical ozone loss in the Antarctic...

➤ This has been changed.

7. Figure 2 and 4

In the last column you show the isentropic view of the cumulative insolation, i.e. between 600 and 800K as well as between 425 and 500K. Maybe you should explain why the highest values start in the polar region (where the polar night is still expected) and move to the south where the sun activity should be the highest. Is it because of the Earth geometry in the relation to the position of the Sun?

This insolation effect seems to be similar for the cold and warm winter. Few additional sentences would help.

➤ The last column of Fig.2 and 4 does not represent the cumulative insolation, but the time change of cumulative insolation, expressed in number of hours per day. In other words, this corresponds to a differential. This change is the most important at the end of the winter and spring at high latitudes, when the sun comes back. Moreover, as explained in Sections 4 and 5, this change of insolation does not indicate only direct exposure of the air parcel to sunlight, but also mixing with air masses from lower latitudes, which were exposed to sunlight for a longer time. High values of this quantity at high latitudes can therefore also be an indicator of dynamical perturbations. This is the case in Fig.2 in late January / early February for example (as explained in Sect. 4).

8. P12 L13

PT-range, I would prefer θ -range

➤ This has been changed.

9. P13

I would recommend to write out the abbreviations MLT and ES because they are only sporadically used.

➤ The abbreviation MLT has been written out. However, we have decided to keep the abbreviation ES for the sake of readability, because it is often used together with SSW (SSW-ES).

10. P13 L31

“using the off-line wind driven isentropic transport” - I think your transport is 3d (diabatic heating), and this effect is important for the here considered time periods of the order of few months.

➤ We have changed the text to “We applied a data assimilation approach based on an extended version of the off-line wind driven isentropic transport and assimilation model DIAMOND, in which cross-isentropic transport was implemented using diabatic heating rates”.

11. P15, L5-15

Here, once again Dobson units defining the contribution to the total column would be better.

➤ Please see our reply to the second comment.

12. P16, L3

This loss begins at higher altitudes in late January.

➤ This has been changed.