Response to Anonymous Referee #1 (RC1):

We would like to thank the first referee for his time, valuable feedback and comments. Below are the original comments and the authors' response (in blue). The changes will be in the new version of the manuscript (in red).

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Review of Bittencourt et al., ***Measurement report: Influence of the Antarctic Ozone Hole in Southern Brazil: Conceptual model for 42 years of analysis the atmospheric dynamics on ozone***

General Comments

The subject of the submitted manuscript is one of great interest, episodes of low total ozone observed in the city of Santa Maria in Brazil located at 29 degrees latitude, caused by filaments of stratospheric air originating in the Antarctic ozone hole.

The authors identify low ozone events using ground-based and satellite-based measurements of total ozone that are 1.5 standard deviations below the climatology, and then class these as of polar influence if the event is associated with an increase in the magnitude of potential vorticity. A case study is then presented in some detail of a noteworthy event of 20 October 2016, which I note has already been the subject of previous publication by the authors. Vertical profiles of the low ozone episodes are studied using SABER data, and finally some analysis is presented of the broader dynamic situation, with a focus on the stratospheric and tropospheric jets.

Unfortunately, I believe the manuscript requires major revisions before it is suitable for publication.

It is not at all clear to me that there is anything new here compared to the authors' previous works on the same subject cited in the references (Bittencourt et. al 2018, Bittencourt et al. 2019, Bresciani et al. 2019, Peres et al. 2019). There is a large amount of overlap with these references.

Agreed. The references in question show results that have already been analyzed and developed in relation to analysis of the influence of the Antarctic Ozone Hole. The difference for this work is the database analyzed using more than 40 years of measurements available using different types of instruments, where it was possible to identify the occurrence of 102 events (as shown in table 2) influenced by AOH in the southern region of Brazil (Santa Maria). In this way, it was possible to create a conceptual model of the atmosphere during the occurrence of these events over the study region.

Therefore, firstly, the new findings of this study need to be made much more explicit.

Agreed. The authors agree that a rewriting of both the discussions and the conclusions identified in this work is necessary.

Secondly, the writing style in general needs to be made much easier for the reader to follow. Each section currently contains a large amount of background material and repetition before reaching the main point. I then often found it quite hard to find and understand the point being made, and what exactly was being said. I suggest shortening the background discussion and removing the repetition throughout the manuscript, and then using more text to explain your new findings more clearly.

Agreed. We will modify the writing of the text, making it more concise and fluid so that the reader has a good understanding.

Specific comments

Figure 10 is not described properly in the caption – from the text I think it shows the composite of 20 hPa PV for all low ozone events with low PV for each month? I think it would also be interesting to show the composite for low ozone events with high PV for comparison.

As the focus of the analyzes is during the AOH activity period (August to November), the analyzes presented here are in relation to these four specific months. Figure 10 presents the monthly anomaly in relation to the climatology of each month, for the 42 years of analysis (1979 to 2020). An organization in writing the new version of the manuscript will be made.

Figure 12 The figure caption says it is the 'monthly climatology', not just for low ozone events – is that correct? Figure 13 is very similar to figure 12 so it's hard to see that there is any difference in the position of the jets when there is low ozone event compared to the average situation.

Agreed. Figure 12 presents the monthly climatology of the vertical cut of the atmosphere, between 1000 and 5 hPa only for the months of AOH activity, that is, from August to November, for the period from 1979 to 2020. The authors agree that perhaps a better description of these analyzes is necessary to make it clear that the study is around four months of AOH activity over the southern hemisphere. In figure 13, the analysis is only for the 102 events of temporary decrease in ozone content identified over Santa Maria.

Figure 13 doesn't look very similar to Figure 6 though, so does this mean the event in figure 6 doesn't show the usual pattern for low ozone events?

As mentioned in the comment above, figure 13 represents only the average of all identified events (table 2) during 1979 - 2020. Figure 6 only shows the behavior of the stratospheric and tropospheric jets during the days of the selected event, in this case October 20, 2016. Below, another example of an event identified in the region.

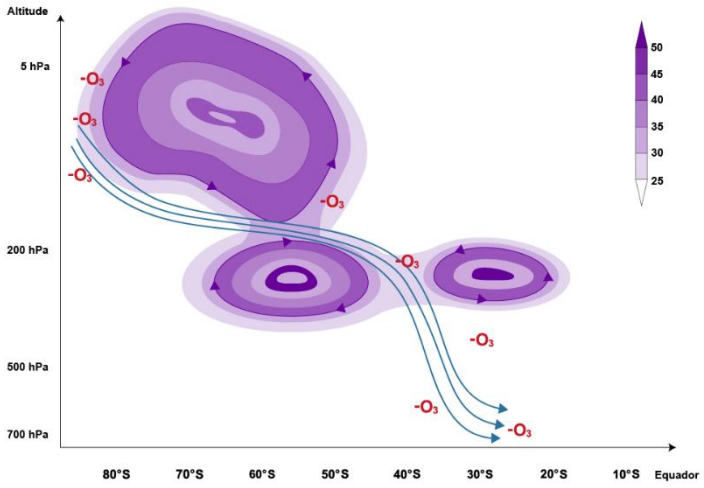
I am very confused about your "conceptual model", and I think it needs to be explained much more clearly. Figure 14 doesn't look at all like figure 13.

The authors agree that the discussions need to be clearer.

Figure 14 appears to show ozone-poor air from inside the polar vortex moving across the width of the stratospheric polar jet (why would it do that?) then moving downwards between the two tropospheric jets to finish close to the surface at 700 hPa. This does not seem to have relevance to the rest of the study, because in the text, all the discussion has been about ozone at altitudes above 20 km.

Figure 14 has been reformulated for better understanding by the reader. The objective of this conceptual model is to show how this transport of ozone-poor air masses reaches mid-latitude regions during the active period of the AOH. Initially, the destabilization of the vortex releases masses of air from within, where the lowest concentrations of O3 are found. With the help of tropospheric jets (subtropical and polar jets), this transport occurs from high-altitude regions to mid-latitude regions. This idealized movement considers the entire period of TCO data analyzed over the Santa Maria region, after identifying these

AOH-influenced events, with more than 40 years of analysis. The blue lines indicate this air mass movement.



Regarding the discussion of the QBO (lines 320-326), you need to show by a simple test that the difference between the number of events in the different phases is statistically significant.

Agreed. The analyzes presented in this paper regarding QBO were very preliminary results, only relating the QBO phase to the AOH period and the identified events. However, this is not one of the focuses of the paper, perhaps carrying out a more in-depth analysis in another work would be more interesting.

Please follow the style guide (https://www.atmospheric-chemistry-and-physics.net/submission.html#english) for the format of dates.

Thank you very much for the suggestions, date corrections will be made.

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