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Interactive comment on "Analysis of an event of short term ozone variation using a Millimiter-Wave Radiometer installed in subpolar region" *by* Pablo Facundo Orte et al.

Anonymous Referee #2

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Title: Analysis of an event of short term ozone variation using a Millimiter-Wave Radiometer installed in subpolar region.

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Overall evaluation

This manuscript analyses an event of polar-vortex-related unusual ozone decreasing at height levels of 27 and 37 km on the stratosphere over Río Gallegos, Argentina, during November of 2014, through a set of remote ground and satellite measurements and dynamical modelling. The subject is appropriate for the scope of Annales Geophysicae. The multiple tools used to analyse the event, and their intercomparison, gives robustness to the work. Results and conclusions imply in general a relevant contribution to the field, given that this type of localized sub-polar ozone reductions, and eventual "mini ozone holes" at lower latitudes, is an atmospheric subject by itself. There are, however, several aspects to revise in order to put the manuscript in conditions to be accepted for publication.

Specific comments:

- The manuscript's title must be as concise and direct as possible, emphasizing the object of study instead one of the used tools. I suggest some like: "Analysis of a November 2014 southern sub-polar short-term ozone variation event". Eventually, if the MWR instrument is cited, please change "Millimiter" by "Millimeter".

- A conceptual aspect to revise throughout the manuscript is the coherence and rigor in the use of terms "polar vortex" and "ozone hole". The "Antarctic polar vortex" is a dynamical phenomenon which has been present probably for millions of years, and their mention is essential when the dynamics is analyzed particularly as a function of the altitude. While, the "Antarctic ozone hole" is the extreme manifestation of the stratospheric ozone layer depletion in the interior of the "Antarctic polar vortex", which has made evident since late 1970s, and is mainly referred to either when their vertical ozone structure is afforded or their consequences on surface are analysed. To speak of "ozone hole", for definition the vertical total ozone column values must fall below 220 DU; authors must revise their use when appropriate. In turn, terms as "ozone hole influence" are appropriate for sub-polar regions but in this case explicit mention to the "Antarctic ozone hole" must be made, eventually an abbreviation AOH may be useful. Similarly, phrases as (page 12, lines 19-20) "the southern part of South America has

been affected by the systematic and abrupt intrusion of the polar vortex during the spring since the 1980's" are inappropriate: as said, the Antarctic polar vortex occurs probably since millions years ago, the difference is that before the 1980s their interior produced no "ozone hole", i.e. ozone values below 220 DU as it is defined, and without the presence of the ozone hole probably the polar vortex intrusions would have no major transcendence for the surface. Authors must take particular care about the use of these key expressions. In this phrase, also the word "systematic" is inappropriate. It could be changed by some like: "the southern part of South America has been affected by the frequent abrupt intrusions of the AOH during the spring since the 1980's". Similarly, the phrase (page 11, line 14) "This decrease is related to the passage of the ozone hole over Rio Gallegos" is wrong, as TOC never falls below 220 DU. Several other paragraphs along the manuscript must be revised accordingly.

- Given that the vertical total ozone column (TOC) values are a necessary reference when ozone anomalies are reported, I suggest a detailed mention to the TOC not only when the present case is analysed but also when mention to other cited cases to help distinguish Antarctic ozone hole "influences" from Antarctic ozone hole "overpass", and ozone hole "reductions" from eventual "mini ozone-holes" or real ozone hole "overpass".

- In the Introduction: as a benchmark for the specific analysis of this work, it would have been desirable a characterization, based on references, of the known springtime typical vertical structure of the atmosphere over southern South America on both "sides" (inner/outer) of the Antarctic ozone hole.

- In the same sense, specific parts of these references could be useful to compare and put in major context the results from this work.

- Given that one of the concerns with ozone negative anomalies is the potential increase in harmful UVB solar irradiance at ground, please could you add, e.g. in Figure 6, other plot of locally-measured clear-sky UV Index (at noon, or at a given fixed solar

zenith angle) allowing quantify the simultaneous UVB increase for these days?.

Minor comments:

Text

- Please define the abbreviations the first time the parameters are mentioned, and then use just the abbreviation. E.g. page 11, line 14: standard deviation is mentioned before, abbreviation SD should be presented the first time it is mentioned and then only SD used. The same for TOC in line 18.

- Page 3, lines 1-2: please change by "due mainly to tropospheric-stratospheric dynamical processes".

- Page 3, lines 6-10: I think a change in the order of paragraphs would make more coherent this sentence. I suggest: "The transport of polar air masses may take the form of "filaments" and "tongue", which induce anomalies on the ozone and UV observations over mid-latitudes. Recently, based on satellite and ground-based observations in Uruguay and Southern Brazil, Bresciani et al. (2018) showed a decrease of ozone over these sites during October 2016 in link to this phenomenon".

- Page 3, line 9: "which induce anomalies on the ozone and UV observations". Anomalies are on the ozone and UV behavior, not on the observations. Please correct.

- Page 3, lines 22-23: phrase "The OAPA is located in sub-polar latitudes, which makes it a suitable site to study stratospheric ozone due to its closeness to the Antarctic ozone hole" is wrong. It could be: "The geographical location of OAPA makes it a suitable site to study the sub-polar stratospheric ozone due to its closeness to Antarctica".

- Page 3, line 31: "decreasing the ozone amount" instead "increasing the ozone amount"?.

- Page 4, some paragraphs of lines 1 up to 8 seem more appropriate for section 2. Materials and Methodology, other for the conclusions and future possibilities. Please

redistribute them.

- Page 7, line 11: define AMF.

- Page 8, line 3: “into the daily cycle”: did you mean “within the diurnal cycle”?. In line 4: please rewrite “that this gas suffer in this layer” in other form.

- Page 9, line 22: replace “Argentina” by “South America”.

Figures

- Text of Page 11, line 10: . . . “light red”. . . but in the caption of Figure 6 it is referred to as "pink".

- Figure 9 and several paragraphs from the Introduction treating on the characteristics of the measurement site (e.g. page 3, lines 21 on) should be at the start of section 2. Materials and Methodology.

- The captions of the figures must contain all the information needed to interpret them. Please revise the captions of all figures. In Figure 2 please correct . . . ratio for three altitudes: 27, 37 and 65 km.

- The abscissas and ordinates legends and labels must explicit clearly the parameters in each axis. E.g. in Figures 2, 4 and 5, the y-legends must include “ozone mixing ratio”. Dates in Figure 3 are better presented in Figure 2. In Figures 4, 5 the altitude may be in form of title for each plot. In Figure 6 the year is not specified, don’t use the abbreviation TOC.

These comments may be considered as relatively “minor changes”. However, I suggest they should be taken as mandatory for a posterior re-evaluation of the manuscript.

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