A review report on the manuscript entitled "Antarctic ozone variability inside the polar vortex estimated from balloon measurements"

by M. C. Parrondo, M. Gill, M. Yela, B. J. Johnson, and H. A. Ochoa

This paper describes Antarctic ozone variability based on ozonesonde observations at Belgrano II station over 13 years and discusses possible mechanisms causing the variability. As Belgrano II station is located at a quite high latitude (78S) compared with most Antarctic stations, the climatology and variation of stratospheric ozone obtained from the ozonesonde data are quite valuable. However, it is difficult to understand from this manuscript what is new knowledge on the Antarctic ozone obtained from this study. Most discussion is simply descriptive by referring to previous studies. I think that more quantitative estimates from viewpoints of dynamics and/or chemistry is needed. For example, it should be more informative to show how different the ozone variabilities in the regions inside and outside the polar vortex are. For this, it is better to analyze data not only at Belgrano II and South Pole stations but also other Antarctic stations located at lower latitudes. In summary, I suggest that the manuscript should be significantly revised before publication for Atmospheric Chemistry and Physics. Other comments are listed below.

1. p.15665 ll.19-20: Salby et al. (2012) showed an evidence of ozone rebound from the analysis of satellite and reanalysis data.
2. p.15664 l.20: The authors define two ozone loss rates, i.e., one determined for August (Figs. 4, 5, and 7) and another for September (Fig. 8). According to Fig. 9, the ozone loss rate at SPS is smaller than that at Belgrano II in August but not in September. However, it may be natural that the ozone loss rate at SPS in September is larger because the sunrise is later at SPS. It should be described why it is "not expected".
3. p.15668 Section 3.1: Please define here "Region I, II and III" which are used in later paragraphs.
4. p. 15670 ll. 8-9: As the partial pressure is not a conservative quantity, the descent rate observed in the partial pressure may not be attributed to the downward motion associated with the Brewer-Dobson circulation. The discussion here should be made using mixing ratio which is a conservative quantity when irreversible mixing and chemical production and loss are absent.
5. p. 15671 ll. 7-8: A similar indication was already made by Sato et al. (2009).
6. p. 15672 l.27: Please note that the ozone loss rate described here is for August, as the authors use another ozone loss rate in September later. Similar description should be made in the captions of Figs. 4, 5, 7, and 8.
7. p. 15674 ll.6-8: This point is interesting. Please describe what the definition of "initial" ozone is. Is it the ozone partial column on the 1st of August? Moreover, please describe possible mechanisms how the "initial" ozone controls the ozone loss rate.

8. p. 15674 ll.19-20: The stratospheric temperature and the strength of polar vortex are strongly related to the planetary wave activity.
9. p. 15675 l. 19: It is better to specify which days of which month corresponding to the 16-17 weeks
10. p. 15676 ll.1-3: This sentence is not very clear. Is “the first four weeks” (and “in four weeks” in the same sentence) means the first four weeks after sunrise? Please specify.
11. p.15676 l. 22: Please specify the altitude corresponding to 475K.
12. Fig. 3: The size and seasonal variation of the polar vortex largely depend on the year. Inter-annual variability should be shown for the daily mean distance from the vortex edge to Belgrano II together with the climatology.