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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Small-scale variability of stratospheric ozone during the SSW 2018/2019 observed at Ny-Ålesund, Svalbard" *by* Franziska Schranz et al.

Anonymous Referee #2

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General comments: This study used the reanalysis and microwave radiometer measurements to investigate the January 2019 SSW event and its impact on the local stratospheric ozone distribution at Ny-Ålesund, Svalbard. The observational data are very useful in verifying this SSW event as reported in recent studies (Rao et al. 2019, 2020), and this manuscript is suitable for the main scope of the journal, "Atmospheric Chemistry and Physics". However, I have some concern about the novelty of the paper. The SSW events, their impacts, and predictions have been widely explored in literature, but this study shows little review on the previous studies (e.g., Charlton et al. 2007JC; Wang et al. 2019ACP; Rao et al. 2018JGR; Zhang et al. 2019Atmos. . .). Two SSWs were observed in February 2018 and January 2019, and the microwave

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radiometer measurements also cover the February 2018 SSW. Therefore, I suggest to add some comparison between the two SSWs. What's the main difference in the ozone distribution between the two most recent SSWs? The authors also emphasize the relationship between the ozone and the SSW split. Because the February 2018 SSW is a typical polar vortex event, the analysis on this SSW is necessary to highlight the January 2019 SSW. In addition, the novelty of this study should be well stressed in the paper. The structure of this version can be further improved. Therefore, I recommend a major revision. Please see my specific comments below.

Specific comments: 1. The English language needs to be further improved, especially the simple tense. The authors used both the present and past tenses.

2. Page 1, Line 14: "number" change to "numbers"

3. Page 1, L18: Wired. Coriolis force is force (units: N), and radiation forcing (W/mˆ2) is energy. How are they balanced?

4. Page 1, L22: Add "one of" before "the most dramastic. . ."

5. Page 2, L1: Add the most recent and relevant references.

6. Page 2, L1: Ill sentence: ". . .lead to . . . increase up to . . ."

7. Page 2, L11-12: Ill sentence: "increases of up to . . . and in the oder. . .."

8. Page 2, L13: "decrease of"??? Do you mean "decrease by"?

9. Page 2, L13: The 2018 SSW should be well reviewed to well compare the two SSW events.

10. Page 3, L15; Page 5, L12-13; Page 9, L11-12: The 2018 SSW event should be incorporated in this study, and you can extract the data. To further improve the quality of the paper, you can make full use of those data.

11. Page 4, L17: Change to "Hagen et al. (2018)". Change to "Figures 2 and 3"

12. Page 5, L31: Should be "first day"

13. Page 5, L22: Should be "the atmospheric component"

14. Page 6, L14-15: The two most recent SSW events are reported in Rao et al. (2018, 2019, 2020)

15. Page 6, L24: The SSW definition of WMO is based on the zonal wind at 60N, not from 60-90N. If your definition is different, please clarify.

16. Page 6, L25, L27: The reversal of wind is fast; how could it last for one month? Do you mean the easterlies last for one month?

17. Page 6, L26: Changed "reform" to "reappear". "Reform" does not mean "form again".

18. Page 7, L1-7: Add some references, because the process of the 2019 SSW has been reported recently in Rao et al. (2019, 2020)

19. Page 7, L9-11: Could you add some comparison between Observations at Ny-Ålesund and those in Wang et al. (2019ACP).

20. Page 7, L15: Do you mean that the elevated stratopause is only observed for split SSW. What did you observe for displacement SSWs?

21. Page 7, L16-18: Did Matthias et al (2012) and Limpasuvan et al. (2016) only composite the split SSWs, or all SSWs? Please clarify. It will confuse readers, because those sentence is following your statement for the split SSW. But the 2019 SSW is not a typical split SSW (Rao et al. 2019, 2020JGR). For the SSW type, also refer to Table 1 in Rao et al. (2019b, doi: 10.1029/2019JD030900), Charlton and Polvani (2007), and Butler et al. (2015).

22. Page 7, L29: The meridional wind in autumn is not that small. The result depends on the reference you compared to. If you compare u wind and v wind, it is indeed so.

23. Page 8, L6: What is "the rest of winter". Please be more specific.

24. Page 8, L7: If you smooth the time series, you can filter out the diurnal cycle. I suggest to remove the diurnal cycle and stress the variation related to the SSW.

25. Page 8, L10: I do not know how you obtain the peak magnitude and the period. You calculate them using the wavelet analysis? Or something else I missed?

26. Page 8, L12, L25, . . .: Change "inside of" to "inside"

27. Page 8, L14-15: Non-informative sentence. Even a nonsense. Please delete.

28. Page 8, L17: Contradict with those sentences if Matthias et al (2012) and Limpasuvan et al. (2016) composite all SSWs (Page 7, L16-18).

29. Page 11, L1: Many reference show the important role of the planetary waves during SSWs. Please add more from the most recent publications.

30. Page 11, L16-19: Can you add some references?

31. Page 11, L24: I do not understand this sentence. Please clarify.

32. Page 11, L30: The equations should be put much earlier. You used the wave 1-2 in early part of the paper.

33. Page 12, L5-7: This sentence is too long, and seems ill.

34. Page 12, L12-13: Ill sentence.

35. Page 12, L29: The tense is change to the past. But you use the present tense most of the time.

36. Page 12, L33: What is the "period considered here"? Be specific. Add a "comma" after "therefore"

37. Page 13, L3: Replace "reform" with other verbs.

38. Page 13, L3-4: "was . . .. and . . . depends" The tense is rather confusing.

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