Reviewer comments on the submitted manuscript: "Semidiurnal solar tide differences between fall and spring transition times in the Northern Hemisphere"

The current paper focuses on differences in variability of semidiurnal solar tide (S2) between autumn and spring in the Northern Hemisphere. The differences were first described using wind data observed by meteor radars at three stations: one at high latitude (Andenes) and two at mid-latitudes (Juliusruh and Tavistock). In brief, S2 was found to decrease suddenly at all observed altitudes in autumn, while in spring S2 decreses more gradually and the decrease occurs earlier at lower altitudes than at higher altitudes. In order to explain these differences, the authors considered contributions from dominant semidiurnal tidal components (SW1 and SW2) provided by HAMMONIA simulation. The authors found that differences in variabilities of both SW1 and SW2 mostly lead to different variabilities of S2 during autumn and spring. In addition, gravity wave (GW) activity observed by meteor radars is stronger in autumn than in spring. This, as suggested by the authors, may also contribute to differences in S2 behavior via GW-tide interaction.

The paper is scientifically interesting. It is generally well written and clearly structured. It also has an adequate length and pertinent title and abstract.

General comments:

1. The introduction mentions only one possible reason, which could lead to S2 differences between autumn and spring (tide-tide interaction). Another possible reason, as you dicussed later in your manuscript, could be GW-tide interaction. Although it is not the main topic of the current paper, I think GW-tide interaction should be briefly mentioned in the introduction.

2. To estimate the tidal information from meteor radar measurements, a running window of 21 days was used. For HAMMONIA simulation, a 30-day window was used. Can you please explain: (1) the reason why 21 days and 30 days were chosen? and (2) why is the window for wind observations different from the window for simulated wind?

Further, extracting tides from HAMMONIA simulation took into account PWs, but extracting tides from radar measurements did not consider PWs. This difference should be explained in the manuscript.

3. For all figures in the manuscript, please add a vertical grid or at least 2 vertical lines for each spring and autumn. This will help the readers very much to follow the variability (decrease) of tidal components that you described in the text.

4. The fall decrease occurs earlier in HAMMONIA simulation than in the observations. This can be seen for all 3 locations and very clearly for Juliusruh and Tavistock. Please describe and explain this fact in your paper.

Specific comments:

Below, the first number is the page number and the second number is the line number or line numbers, separated by a forward slash. For example, 2/5 refers to page 2, line 5; 3/10-12 means page 3 lines 10 to 12.

1. 1/19: PW → PWs

2. 1/20: GW → GWs

3. 1/22: "they have typical periods ...". Some rewording may be needed. My suggestion: "The most dominant tide components have periods .."

4. 2/14: It is helpful for the readers to introduce again the abbreviations (SW2 and SW1) here in parentheses

5. 3/13: "The mean winds .." → "The zonal mean winds .."

6. 4/14: Which part of GW spectrum can be seen by your measurements? Please specify the observed GW spectrum.

7. 4/23-26: Do you have any explanation for the ealier decrease during the years 2009, 2012, 2013 and the lower amplitude during 2013?

8. 4/28: What is the reason of more variability during the spring?

9. 4/30: Can you please explain why the duration is longer at high latitudes than at middle latitudes?

10. 5/10: Is it possible to turn off the GW parameterizations and see how much GW-tide interaction influences S2 variability?

11. 7/14: Do you also see the annual variability in HAMMONIA simulation?

12. 7/14: Please mention that the fall decrease in simulation occurs ealier than in observations. Further, the simulated S2 amplitude is higher than observed S2 amplitude. Can you please also comment on that?

13. 7/28: "These differences are reproduced .. model" → "These differences are reproduced .. model to a certain extent"

14. 8/0: Title of Fig. 4: CMOR → Tavistock?

15. 9/8: For observations, you showed the phase analysis for S2 (Fig. 4). For simulation, why don't you show the phase analysis for the same S2? why did you choose SW2 instead?

16. 9/25: I agree with the authors that GW-tide interaction requires a thorough analysis, given that not only the simulation, but also your observations contain only a certain part of the GW spectrum, and different parts of the GW spectrum can interact differently with tides. The interaction of other parts of the GW spectrum with S2 cannot be estimated here and may also influence the S2 variability. Maybe you should add one sentence here to clarify that fact.

17. 9/27: "the GW activity" $\rightarrow$ "the long-wave GW activity"

18. 9/30: Would you conclude that long-wave GWs suppress the migrating semidiurnal tide SW2 amplitude?