

Weather Clim. Dynam. Discuss., author comment AC1  
<https://doi.org/10.5194/wcd-2021-16-AC1>, 2021  
© Author(s) 2021. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Reply on EC1

Corwin J. Wright et al.

---

Author comment on "Dynamical and surface impacts of the January 2021 sudden stratospheric warming in novel Aeolus wind observations, MLS and ERA5" by Corwin J. Wright et al., Weather Clim. Dynam. Discuss., <https://doi.org/10.5194/wcd-2021-16-AC1>, 2021

---

Dear all,

I have now had chance to discuss it with co-authors. Apologies for the short delay while I did so.

First, while I only address top-level structure in this response, I should make clear that I have read and acknowledge all the specific comments provided by Drs Krisch and Manney, and greatly appreciate the significant time they have spent on their reviews. Most of the changes requested are excellent suggestions that will significantly strengthen the manuscript when implemented. I hope to respond to each comment individually and in detail at a later date.

In the remainder of this Comment, I will address only the top-level debate on which Dr Knippertz has requested a speedy response. I will first summarise my interpretation of the two suggested approaches, and then respond to them both in combination.

Dr Manney has suggested taking the material from the existing manuscript and splitting it into two manuscripts, which I will term Manuscripts 1 and 2. Manuscript 1 would be focused primarily on validation of how Aeolus represents extreme events such as SSWs, and Manuscript 2 would use reanalysis data only to study the 2021 SSW.

Dr Krisch instead suggests a different approach, which I will term Manuscript 3. This manuscript would be broadly similar in conception to the current manuscript, but would be simplified in structure, and use more observational data and less reanalysis data (specifically switching ERA5 GPH for MLS GPH), and better describe the calculation of the Aeolus winds.

In general, my intended conception of the current study (which my co-authors have supported in email discussion) is very significantly closer to Manuscript 3 than to Manuscripts 1 and 2, but I agree that the work presented could be sensibly modified to separate out the material for a separate Manuscript 1. In line with this conceptual model, I propose the following approach:

----

A. The current manuscript would be transformed into something close to Manuscript 3, as

follows:

Aa. remove both appendices, adding a concise section of text which more carefully explains the method used to project the winds.

Ab. remove the current Section 6 ("Mesoscale forcing").

Ac. remove all text describing results from these sections from the introduction, conclusions and other sections

Ad. restructure and reorder the text to provide a clearer flow.

Ae. investigate the possibility of using MLS GPH data instead of ERA5 data. This could work well for Figure 9, which is stratosphere-only, but may not be a viable approach for Figure 10 as this which relies on reanalysis output below the bottom of the MLS scan. A hybrid approach may be possible here using MLS GPH in the upper part and ERA5 below with the cutoff between the two clearly indicated, and I can investigate this, but there may be more benefit to using the same product across the full height range, even if this leads to a slight disjoint with Figure 9.

--

B. The validation and methodological material would be removed to a new manuscript, to be submitted in principle to Atmos. Meas. Tech. or a similar journal. This manuscript would contain:

Ba. an extended form of Appendix 1, including a new section showing the benefits and disbenefits of different methods of estimating  $u$  and  $v$  from Aeolus. Co-author Hindley and I have discussed the possible contents of such a section today. The assessment would be carried out for both 2020 and 2021, as the 2020 data should be out of embargo\* soon.

Bb. an extended form of Appendix 2, including spatial as well as zonal-mean comparisons.

Bc. a detailed investigation of the 'lag' seen in Figure 1 between Aeolus and the reanalysis/analysis products, to investigate whether the differences are due to spatial sampling or a real lag in the assimilative systems.

Bd. [perhaps] a modified version of the current Section 6.

(\* the seemingly-odd choice to test on 2020 was because I did not realise the 2020 data were still under embargo when carrying out the assessment - early drafts of the manuscript more logically included a full comparison to the preliminary 2020 observations!)

--

My estimate is that these changes would reduce the manuscript length by just over 10 preprint-format pages, i.e. approximately a third of the current manuscript length without references, and provide sufficient material for a second manuscript of roughly similar length and technical level to e.g. the currently under-review <https://amt.copernicus.org/preprints/amt-2021-93/> . Such a split and rearrangement would address all the top-level concerns of Dr Krisch, and address one of the primary concerns of Dr Manney, specifically that the validation objectives of the paper do not mesh well with the science objectives.

The key area in which Dr Manney's comments would not be addressed by this approach is that observational data would be retained for the current study, rather than switching to entirely reanalysis data for these objectives as she proposes. I strongly disagree with a change of this nature:

1. I feel this suggestion may have arisen due to a possible large mismatch between authorial intent and reviewer interpretation of that intent, likely due to poor communication by myself when writing the introduction. Essentially, the manuscript Dr Manney is requesting describes a significantly different study to the work we have actually done and the manuscript we have set out to write. Due to this very significant mismatch, making such a change would, in practice, mean discarding all of the work carried out and starting again ab initio with only an outline structure and no scientific content, with the end result being a manuscript the authorial team never set out to write.

2. More broadly, I feel it is important that we as a scientific community continue to carry out wholly-observational science to at least some degree, rather than switching to reanalysis for all dynamical studies of the lower and lower-middle atmosphere. Modern reanalyses are indeed excellent (I have lead- and coauthored several papers myself quantitatively demonstrating this!), but we know that they still have many important biases and inaccuracies, and this is doubly the case when looking at variables not assimilated into the models such as (for ERA5) observed winds.