

10/08/2021

Response to the editor

Title: Interactive 3-D visual analysis of ERA 5 data: improving diagnostic indices for marine cold air outbreaks and polar lows

Authors:

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Dear Prof. Wernli,

thank you very much for handling the manuscript and helping to improve it further by means of these final technical corrections. We greatly appreciate the positive decision and the opportunity to publish in WCD.

You find below a brief response to each of your comments. In summary: we have addressed all technical corrections as suggested.

Yours sincerely,

Marcel Meyer, on behalf of all co-authors.

L75: provide → provided

Response: adapted.

L83: discuss → discussed

Response: adapted.

L125/127 and throughout the paper (e.g., also in caption of Figs. 1, 2, 3, etc.): the format of dates differs from case to case and is not according to journal standards. The format should be “on 18 December 2002”, or “at XX:00 UTC on 18 December 2002”.

Response: adapted throughout.

L135: symbols t , p_v , ... are not defined. I don't think that they are required here, you can omit them. In case you decide to keep them, then please introduce the symbols and then t should be T , z should be Z , and p_v should be PV .

Response: deleted, thanks.

L140: I think you have all these references already in the introduction (where they are important). Here they can be omitted.

Response: deleted, thanks.

Eq. 2: I am not sure that this notation is elegant and fully appropriate. In my understanding, $m_p\theta$ is a function of p . Therefore $m_\theta(p)$ would be, in my view, the more appropriate notation. The full equation should then read: $m_\theta(p) = \theta_{\text{skin}} - \theta(p)$

Response: Our motivation for using a superscripted p was that it ensures unique symbols for each of the three variants of the conventional index (m_{θ} , m_{θ}^p , $m_{\theta}^{p_{\text{crit}}}$). However, we agree, the parentheses seem more intuitive, and one could also use the same symbol (m_{θ}) and then denote the dependency on p in parentheses. To us it seems that the latter could have the disadvantage that the parentheses (p), or their absence, need to serve as the unique identifier in the text when referring to the different metrics via their symbol (e.g. m_{θ} vs $m_{\theta}(p)$). Overall, we are also unsure about the optimal notation here. Both seem fine to us. To address the recommendation, we changed the notation as suggested, and checked that the use of the notation in the text allows unique identification. For consistency, we have also exchanged the use of p as subscripts to θ by $\theta(p)$ throughout.

L168: for the vertical levels → for all vertical levels

Response: adapted.

L183 and in many other places: during years → during the years

Response: adapted.

L209: should read “performance of the diagnostic ...”

Response: adapted.

L214: should read “(in this case a diagnostic index)”

Response: adapted.

L219: confusing ... what is T ? Is $T = t_{\text{end}} - t_0$?

Response: yes; included the definition.

L222: should read “(a comparable approach ... was used in Terpstra ...”

Response: adapted.

Caption of Fig. 1: $\text{kg/kg} \rightarrow \text{kg kg}^{-1}$

Response: adapted.

L257: $\text{m/s} \rightarrow \text{m s}^{-1}$

Response: adapted.

L258: references should be in chronological order

Response: adapted.

L262: I don't understand “Resolved dynamics of cloud cover”. But maybe it is anyway best to delete this sentence?

Response: deleted.

Caption of Fig. 2: please shorten this caption. The caption should only explain what the lines, colors, ... in the plot mean, but the caption should not interpret the figures. The sentences “As expected ...” and “The illustrated aspects ...” can be deleted and the rest can be shortened

Response: shortened.

L290-300: here I had the feeling that this is mainly repetition from Sect. 2.3. Please consider to shorten this part.

Response: shortened.

Eq. 5: again the notation, I suggest to write $\theta(p^*)$ instead of the subscript.

Response: adapted.

L317: delete “defined here ...”, this was mentioned before.

Response: deleted.

L353: low or absent forcing → weak or no forcing

Response: adapted.

L361: delete “or any fitting procedure” (or explain what it means)

Response: deleted.

L391: “as compared” → “compared”

Response: adapted.

Eq. 7: and another notation: in the same spirit as above I suggest $m_{\theta}(p_{\text{crit}}) = \theta_{\text{skin}} - \theta(p_{\text{crit}})$

Response: adapted.

L534: do you really want to emphasize the “slow-wind eye” here? In every circular symmetric vortex the wind speed must be zero at the center, so the “slow-wind eye” is not so much a surprise(?).

Response: we meant to emphasize that the spatial res. of ERA5 is high enough so that the 3D iso-surfaces computed in Met.3D neatly resolve this feature. Whilst not a surprise that there are slow winds in the center, we think it's an interesting perspective (in Fig. 3) to illustrate that the coherent volume of air with slow winds reaches high up into the stratosphere. However, apparently this didn't come across as desired in this part and it is certainly not central overall, so we have deleted that part of the sentence. Thanks.

L546: report → reported

Response: adapted.

List of references: unlike the main paper, this part is not yet in very good shape. Often Page numbers, volume numbers or DOIs are missing. Sometimes journal names are abbreviated, sometimes not (please check in other WCD publications for the standard abbreviations to be used). Also please update the reference of the Afargan-Gerstman et al. paper.

Response: corrected, i.e.: added page numbers, volume number and DOIs were missing, consistent use of journal abbreviations, update of the Afargan-Gerstman et al. paper.