

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
<https://doi.org/10.5194/hess-2021-41-RC2>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.



Comment on hess-2021-41

Anonymous Referee #2

Referee comment on "A 10□km North American precipitation and land-surface reanalysis based on the GEM atmospheric model" by Nicolas Gasset et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-41-RC2>, 2021

General Comments:

Overall this is a good paper which should be published. The authors develop and document an approach to produce reanalyses related to the Canadian operation NWP prediction system with an aim towards water-driven applications. The approach developed and described herein is complex and involved and sometimes leaves one with a feeling of "chewing gum and baling wire (in that a sequence of inline and offline tools are strung together in several different ways, bootstrapping down-scales, to reach the objective)." This remark is not intended as a criticism or in a negative sense: another way to state this is that this is an inventive application of available tools, that leads to some useful insights and establishes a workable system to produce reanalyses over North America.

I found the organization of the paper to be reasonable and the writing was mostly clear. Likewise, I do not have any major technical criticisms of the paper either, and found myself more or less resonating philosophically with the authors' decisions, and agreeing with their logic given their objectives and circumstances. A few suggestions to improve the paper in places are offered below.

Specific Comments:

On ~line 230 + ... It is slightly disappointing, if understandable, why the authors did not employ radar data in this work. I hope that future work will allow the authors to explore the use of radar data to improve precipitation analyses and assimilation. Likewise, perhaps future developments will allow them to simplify and streamline the overall process.

I was also disappointed that cloud and radiation fields were not analyzed and evaluated herein (or at least they were not presented). These could have significant impacts on the water and energy budgets, and hence on the analysis and interpretation of the other hydro-meteorological fields and their application by others. This in fact may be the most serious technical deficiency in the paper though I do not think it should prevent publication.

Lastly, in interpreting some of the biases in surface temperature and moisture in section 3, the authors may wish to consult a recent paper by Barlage et al. in GRL (2020): Barlage, M., Chen, F., Rasmussen, R., Zhang, Z., & Miguez-Macho, G. (2021). The importance of scale-dependent groundwater processes in land-atmosphere interactions over the central United States. *Geophysical Research Letters*, 48, e2020GL092171.

<https://doi.org/10.1029/2020GL092171>

(<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020GL092171>), which found both scale dependencies and a significant impact from coupling in ground water processes.

Technical Corrections:

To help readers better understand the author's work, the following suggestions are offered:

- Line 278, incomplete sentence: "In order to produce a reanalysis of precipitation and land surface <***>, in addition..." <***> = a missing word: is it "land surface states" or "...fields" or "...parameters", etc.
- Line 313, "mosaicked from regional multi-sensor (radar+gauges) precipitation < * analyses * > (MPEs) produced by the 12 River Forecast Centers" -> "analyses" should be "estimates".
- Lines 442-443, in the sentence "...as well as observations < * across the atmosphere * > than results from...", it is not clear what is meant by "across the atmosphere". Vertically? Geographically?.
- In Figure 9, the caption (at least) should define what the x-axis is in the figure (it is defined in the text, but help the reader out here...): "The x-axis is the precipitation threshold (in mm day⁻¹)."
- For Tables 4 & 5 (in the captions and where referenced in the text) present differences of RMSE, but the differences are never defined [is it 'X-Y' or 'Y-X'?]. The reader can of course 'figure it out,' but why not help the reader understand more quickly, and instead of saying (e.g.) "RDPS vs. RDRS-10", say "RDPS - RDRS-10".

Acronyms:

The authors should carefully review the use of acronyms, both to ensure that they are defined and/or are defined on first use. Some examples this reviewer found:

- "ERA" (-5 and -Interim): first used on Lins 20/21; not properly defined.
- "ISBA": used first on line ~143 (not defined until later in document).
- "RSAS": introduced in figure in section 2.1; defined later in section 2.2.
- "SYNOP, SWOB and METAR": used on line 240; defined later in section 2.5.
- "COOP": line 290, not defined.