

Hydrol. Earth Syst. Sci. Discuss., author comment AC1
<https://doi.org/10.5194/hess-2021-41-AC1>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reply on RC1

Nicolas Gasset et al.

Author 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-AC1>, 2021

Thanks a lot for this review and positive comments.

Concerning your major comment, as indicated in lines 123-125 of the manuscript, "a resolution of 10km was chosen for the production of a 1980-2018 reanalysis, in order to match the current resolution of the Regional Deterministic Prediction System (RDPS) and of the Regional Ensemble Prediction System (REPS) currently in operation at CCMEP for short-term weather forecasting over North-America". Having the same resolution for the three systems (RDRS, RDPS and REPS) facilitates the computation of anomalies (by comparing RDPS or REPS to the RDRS climatology), and simplifies its application by end-users who make regular use of RDPS or REPS. The long-term plan for the RDRS is to stay as much as possible in sync with the RDPS and REPS in terms of GEM model configuration and resolution, and re-launch the reanalysis whenever major changes are made to RDPS or REPS. Finally, although some degradations are seen when increasing the resolution from 15 km to 10 km, it is shown in the paper that these differences are small. In particular, the gains obtained in terms of precipitation skill through the optimal interpolation of precipitation observations largely compensate for this small degradation (see Figure 9). It is also worth mentioning that from an hydrological application point of view, an improvement is obtained when using 10 km resolution instead of 15 km, as illustrated by Figure 10.

During the early stage of the project, the originally targeted resolution and configuration of the system was 10 km for the very same reason as noted above. However, technical and computational resources reasons prevented from producing this preliminary 5 years sample (2010-2014) at a 10 km resolution (which was mostly dedicated to produce a proof of concept.)

The authors agree that this should be stated more clearly and re-enforced in other sections of the manuscript, notably in Section 4.1 and 5. This will be included in a revised version of the manuscript.

Concerning your minor comments, they will be all answered as you suggest in a revised version of the manuscript. Here we would like to further come back on some of them as we think that it can be useful and interesting for the discussion.

L247:

In fact, an a posteriori CaPA-24h approach was applied on both the GDRS (albeit on a subdomain covering North America only) and RDRS for the preliminary 5 years sample.

https://collaboration.cmc.ec.gc.ca/science/outgoing/capa.grib/hindcast/capa_hindcast_rdrs_v1/Evaluation_CaPA_Reanalysis_North_America_2010-2014.pdf

Given its usefulness, higher added value and better results, only the higher resolution CaPA-24h was produced for the final 1980-2018 reanalysis and discussed in the paper. We will remove this GDRS CaPA-24h mention from that sentence.

Line 531:

While it is true that RDRS-15 is slightly better than RDRS-10 for absolute and dew point temperature but not for the wind speed, it should be reinforced that despite that fact, the RDRS-10 remains better than RDPS (the operational forecasting model which is the main goal of the comparison). This is further explained around line 540.

L704:

Models relying on NWP outputs typically require to be calibrated in order to perform optimally, partly due to the errors/biases and shortcomings of their input datasets. This is particularly true for surface and hydrologic models.

Such a calibration can only be performed based on archived (historical) datasets that ideally "feature" similar error climatology as the product used to drive such models in the context of forecasting. However, archived datasets from operational NWP models tend to evolve in time, and/or are usually not available for time periods long enough for such a calibration.

Hence, the importance of having a retrospective dataset that is as close as possible to the operationally produced forecast. It thus further illustrates the importance of having a 10 km resolution along with model configuration similar to the one used to produce operational forecasts.

Another important point worth mentioning is that hydrological models are not only used to predict future flows. For example, they can be used to predict past flows at ungauged locations, to infill missing data at gauged locations, and to perform what-if scenarios to assess the impact of climate change, land-use changes and reservoir regulation changes.