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Geoscientific Model Development Discussions

Interactive comment on "GlobSim (v1.0): Deriving meteorological time series for point locations from multiple global reanalyses" *by* Bin Cao et al.

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Anonymous Referee #2
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Response to Anonymous Referee #2

The authors would like to thank the reviewer for the constructive feedback, and the thorough assessment of the manuscript. Below we provide a point-to-point response to each comment, reviewer comments are given in black, responses are given in blue. Additionally, we have included details of how we intend to address these changes in a

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Discussion paper

revised submission.

Reviews for “GlobSim (v1.0): Deriving meteorological time series for point locations from multiple global reanalyses” by Cao et al.

This study develops, describes and validates the GlobSim, which aims to downscale the gridded reanalysis atmosphere data to a single point scale, in order to drive models for single simulation research. Single simulation is generally important, e.g., for development of model and research on mechanisms. But usually forcing data is scare, particularly in high mountain or high latitude regions, resulting in that many simulation experiments can not be carried out in this regions. This study attempts to better use the reanalysis data to solve this issue. The topic is important. The study also contains large amount of work, well writing and clear organization. Generally, it has a potential for publication. I have several comments that is considered to improve the paper

1 My main concern is the validation. The paper develops the GlobSim that aims to output the better atmosphere forcing data. So, first, the output results (atmosphere data) should be validated to see whether the better atmosphere forcing data are produced. Then they can be used to forcing model and some validations are further performed to see whether simulated results are better, which in turn also have a strong demonstration of the better forcing data. Now, the study directly validated the simulated results. As we known, simulation performances are determined by both forcing data and models. In this case, better simulation performance may be caused by model rather than forcing data, and so not reaching the main target that forcing data are actually needed to be validated.
Response: The basic assumption of GlobSim is that, as we stated in section 4, *"Reanalysis products are carefully designed and tested before release. In addition, many studies have evaluated their performance by inter-comparison, by*

comparison with observations (e.g., Jiang et al., 2015) and by applying them to model simulation (e.g., Albergel et al., 2018; Beck et al., 2019).".
Fiddes J. and Gruber, S. (2014); SenGupta and Tarbonton (2016) have done the validation with meteorological data and, for individual realanysis. This kind of study demonstrated that using surface and pressure level information can help to provide better data at fine scale with relatively simple methods and requiring a full atmospheric model. These were done at a place that is particularly useful to make this point: mountains because they have strong fine-scale variability, and the great in-situ data available could support such detailed evaluation.
GlobSim now enables the application of such methods more broadly. We demonstrate its utility (also having multiple reanalyses) at a location where topography does not dominate microclimatology. Otherwise, we would be re-doing Fiddes J. and Gruber, S. (2014); Sen, A. and Tarbonton, G. (2016)'s work in some way and thus distract the reader from what is really new here. What remains is the need for a tool that allows to generate time series and, where required, interpolate spatially. We use interpolation in this manuscript because it allows us to compare reanalyses on differing grids for the same point location.
For these reasons, we inter-compared the GlobSim-derived meteorological variables (Fig. 3) in order to appreciate differences or detect blunders in conversion rather than directly comparing them with observations, although a detailed air temperature evaluation is present (Figure 8a, Table 5).

2 I also suggest that this study used the direct atmospheric forcing data in sitematched grid's reanalysis data (i.e., value in a simulation grid) to carry out a reference experiment, and then to compare with GlobSim results (single point) forced results. This comparison can really demonstrate the advantage of GlobSim.
Response: As we simplify ground locations that span an area wider than a typical reanalysis cell into a common center point, the comparison of this point with grid results will have little meaning. This study is the first step (v.1.0), GlobSim has not

yet implemented other (e.g., Fiddes J. and Gruber, S., 2014; Sen, A. and Tarbonton, G., 2016; Cao et al., 2017), although the upper-air information has already been included. We hope significant improvements between grid and GlobSim would be achieved via coupling a number of scaling methods in the future.

3 Page4, Line2, Page4, Line2, a newer literature (Estimates of global surface hydrology and heat fluxes from the Community Land Model (CLM4.5) with four atmospheric forcing datasets. Journal of Hydrometeorology. 2016, 17, 2493-2510) is suitable for this discussion.
Response: Thanks, the manuscript of Wang et al. (2016) will be added in the revised manuscript.

4 Table 2, the resolution of JRA-55 should be 1.125 rather than 0.56
Response: Yes, the resolution of reanalysis is 1.25° or about 150 km (Kobayashi et al., 2016.)

5 Page15, L11, remove the "."
Response: It will be deleted in the revised manuscript.

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