

Earth Syst. Sci. Data Discuss., referee comment RC3
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Comment on essd-2021-460

Anonymous Referee #3

Referee comment on "A 148-year precipitation oxygen isoscape for China generated based on data fusion and bias correction of iGCMs simulations" by Jiacheng Chen et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-460-RC3>, 2022

As natural tracers of the water cycle, long term water stable isotope data are useful for hydrological and climatic studies. Chen et al. compiled observational precipitation oxygen isotope data from mainland China and eight iGCM simulation datasets from SWING2 to create a 148-year long monthly resolution precipitation oxygen isoscape for the mainland China. Rooted in the choice of the raw data, however, the usefulness of the generated data to the community is very limited. The processes and uncertainties regarding downscaling the model data from a resolution of 2 to 3 degrees to 50-60 km are also missing from the current manuscript. Therefore, the reliability and usefulness of the generated are highly doubted.

Major comments:

The selection of raw data:

Model outputs in the SWING2 project are from model versions of more than a decade ago, during which model physics and parameterizations have been updated for several versions. Such outdated data may only be used in the case of qualitative comparisons. While in such a quantitative data description paper, any new data generated from these raw data would inherit the quality issues in earlier model versions. Some of the model data from newer versions have already been made publicly available.

I find that the authors did not use simulation data from all models participated in the SWING2 project. However, the reason why the authors partly selected the datasets is not given.

Although the study is dedicated to the region of mainland China, adding station observations from neighboring regions would improve the quality and confidence of the generated data, especially at the margin of the mainland China.

During most of the time, data from only one model was used and there were limited or even no observations. For example, the authors used HadAM3 outputs for 1870-1957 when no observations are available. Several data quality issues arise for this period. During periods when there are observations, HadAM3 was not perform well over the study region. For the period of 1870-1957, the optimal method (among the methods evaluated by the authors) was also not used.

Methods:

My largest concern regarding the methods is the downscaling of the model outputs. I totally missed how the model outputs with resolutions of 2 to 3 degrees are downscaled to 0.5 degrees. The mainland China has a complex climatic and geographical characteristic, which could make the oxygen isotope ratios also have complex spatial variability at sub-pixel levels.

The consistency and the continuity of the data is also not guaranteed. The authors used CNN fusion for 1969-2007, and BCMs for the rest of 1870-2017. However, the different methods have different performance.

It is unclear how the observations are compared with iGCM outputs or the generated data: observations are at point level, iGCM simulations and the generated data are at grid level, comparisons are made at regional level.

Observations only cover a small part of the study period, and the authors may need to try to incorporate some proxy data.