

Response to Reviewer 2's comments

We would like to thank Reviewer, Referee #2, for his/her thorough review and constructive comments that have helped improve the quality of our manuscript. To address Reviewer 2's comments, we have made revisions in the text. Our point-by-point responses to Reviewer 2's comments are given below. For your convenience, we have also uploaded a version with tracked changes.

Yin et al. developed the East Asia Reanalysis System (EARS) and constructed a 39-year (1980–2018) reanalysis data over East Asia via the system with multi-source observations assimilated. The EARS and used observations are described in detail and principal work is conducted to validate the reliability of reanalysis datasets. This work is necessary and the conducted data has important potential applications for regional weather and climate studies. This manuscript is generally in a good shape. However, several minor revisions are still required before publication, listed as follows.

Answer: We appreciate you very much for your kind words about our manuscript. Your positive and constructive comments and suggestions are valuable in improving the quality of the manuscript.

【Minor comments】

(1) The EARS covers a large domain. However, the observations out of China were not used in the validation. Although the results are reasonable and representative, it is advisable to give a detailed explanation in the text.

Answer: We already provided an explanation in Subsection 2.3 as follows:

“It should be noted that the present validation is based on the observations from China Meteorological Administration (CMA). Although the EARS covers a large area, only limited observations out of China were obtained by the Global Communication System (GTS). Comparatively speaking, the density of observations is much higher in China than that out of China. Besides, the performance of observations in China is at a comparable level because of the same (at least equivalent) observational instruments and methods. Moreover, the observations in China were quality controlled using the same methods. Therefore, the observations in China were used in the validation. We welcome more validation from others with observations outside of China as much as possible.”

(2) Did the authors compare EARS with other regional and/or global reanalysis data, such as ERA5, CFSR, JMR, and others? This may be beyond the scope of this paper as the main purpose of this paper is to present EARS and preliminary results. If not, please specify this issue, which may encourage readers to conduct potential associated work.

Answer: We agree that this would be an interesting question, and we have further discussed it in the last paragraph. We are fully occupied with EARS development and data generation. The EARS data was verified against both surface and sounding observations. The results were also compared with its parent—the ERA-Interim. At

present, comparisons with other global reanalyses are on our schedule but progress is slow (e.g., Yang et al., 2022). As far as we know, the assessment of reanalysis data is a complex and systematic task. Therefore, we expect more scholars to evaluate EARS data from different aspects, such as the performance in reproducing weather systems (e.g., Gong et al., 2022), daily variation in precipitation (e.g., Li et al., 2017), and others, as well as comparisons among different reanalysis (e.g., Yang et al., 2022).

Gong, Y., S. Yang, J. Yin, S. Wang, X. Pan, D. Li, and X. Yi, 2022: Validation of the Reproducibility of Warm-Season Northeast China Cold Vortices for ERA5 and MERRA-2 Reanalysis. *Journal of Applied Meteorology and Climatology*, **61**, 1349-1366, doi:10.1175/JAMC-D-22-0052.1.

Li, J., T. Chen, and N. Li, 2017: Diurnal Variation of Summer Precipitation across the Central Tian Shan Mountains. *Journal of Applied Meteorology and Climatology*, **56**, 1537-1550, doi:10.1175/JAMC-D-16-0265.1.

Yang, L., X. Liang, J. Yin, Y. Xie, and H. Fan, 2023: Evaluation of the Precipitation of the East Asia regional reanalysis system mainly over mainland China. *International Journal of Climatology*, doi:10.1002/joc.7940.

(3) Given the present results, the EARS datasets are encouraging and promising. This paper is to report the progress of the project. I suggest the authors try to share all the EARS data to the public as soon as possible for potential applications.

Answer: Thank you very much for your kind words about this work. We agree with you that the large volume of data prevents them from being shared effectively. The database format is GRIB version 1 and the total volume of the data files is 54.6 TB. As the total data exceeds the volume that could be provided by freely Zenodo (Yin et al., 2022), we will put the data on the CMA Data-as-a-Service platform (<http://data.cma.cn/>). However, storing data on the CMA platform requires a certain amount of time for application and approval. We will complete the sharing of the EARS data as soon as authorization is granted. Relevant information will also be updated in Zenodo (Yin et al., 2022).

Yin, J., X. Liang, Y. Xie, F. Li, K. Hu, L. Cao, F. Chen, H. Zou, F. Zhu, X. Sun, J. Xu, G. Wang, Y. Zhao, and J. Liu, 2022: East Asia Reanalysis System (EARS) [Data set]. *Zenodo*, doi:<https://doi.org/10.5281/zenodo.7404918>.

(4) Lines 100-102: changing “*intending to produce a high-resolution regional atmospheric reanalysis dataset for East Asia, with high quality for mesoscale weather system study and regional climate analysis*” to “*intending to produce a high-resolution regional atmospheric reanalysis dataset with high quality for mesoscale weather system study and regional climate analysis over East Asia*”

Answer: Revised accordingly.

(5) Line 71: Please provide the horizontal resolution of China’s first generation of global atmospheric reanalysis (CRA40) for general information.

Answer: Revised accordingly, i.e., “although China’s first generation of global atmospheric reanalysis (CRA40) was released recently, with a horizontal resolution of approximately 34 km and a temporal resolution of 6 h”.

(6) Line 176: changing “regular” into “conventional”.

Answer: Done.

(7) lines 306 and 311: missing “the” before RMSE.

Answer: Done.

(8) Line 324: modifying “*that WRF downscaling at a high resolution has significant performance gains in downscaling*” to “*significant performances have been gained in WRF downscaling at a high resolution*”.

Answer: Revised accordingly.

(9) Line 397: Please provide references for “*previous studies and with operational predictions*”.

Answer: As suggested by the reviewer, we have added more references to support this idea (e.g., Mao et al., 2010; Zhang et al., 2021; Zhao et al., 2018).

Zhang, J., T. Zhao, Z. Li, C. Li, Z. Li, K. Ying, C. Shi, L. Jiang, and W. Zhang, 2021: Evaluation of Surface Relative Humidity in China from the CRA-40 and Current Reanalyses. *Adv. Atmos. Sci.*, **38**, 1958-1976, doi:10.1007/s00376-021-0333-6.

Zhao, S., W. He, and Y. Jiang, 2018: Evaluation of NCEP-2 and CFSR reanalysis seasonal temperature data in China using detrended fluctuation analysis. *International Journal of Climatology*, **38**, 252-263, doi:10.1002/joc.5173.

Mao, J., X. Shi, L. Ma, D. P. Kaiser, Q. Li, and P. E. Thornton, 2010: Assessment of Reanalysis Daily Extreme Temperatures with China’s Homogenized Historical Dataset during 1979–2001 Using Probability Density Functions. *Journal of Climate*, **23**, 6605-6623, doi:10.1175/2010JCLI3581.1.