essd-2024-297 “Global Stable Isotope Dataset for Surface Water”

The manuscript entitled "Global Surface Water Stable Isotope Dataset" effectively compiles stable isotope data from surface waters around the world, a first and unique dataset that is important for advancing hydrology and meteorology research. Based on my many years of work in the field of isotope hydrology, I believe this is a fundamental and important piece of work. This work will inevitably greatly promote the global sharing of data in the field of isotope hydrology and facilitate the coordinated observation of global surface water isotopes.

A sincere suggestion: the authors should consider inviting more international colleagues to participate in similar global studies. In fact, I have been following the achievements of the author's research group in recent years (which are very outstanding). I believe that globally collaborative research would be very beneficial for the authors to increase the impact of their articles, and would also better promote data sharing and global coordinated observation.

After a thorough review of the data, I am convinced that the quality control measures for the stable isotope data are rigorous and I wholeheartedly support its publication, but the authors still need to address the following questions before publication, I feel that such an excellent paper deserves better expression.

Major comments:

1. The introduction is well written. However, the author needs to add some research progress on stable isotope datasets for surface water and how they compare.

2. Section3.3 The predictors used here are not independent, e.g. evapotranspiration is influenced by parameters such as temperature and wind speed. Does this possible interdependence affect the results and conclusions?

3. Section 3.4 This section should highlight the applicability of the surface water stable isotope dataset, comparing it to current research and emphasizing the scientific value of the data.

4. Section 3.4 Recognize any limitations in your study that may affect the interpretation of the results.

5. Some references in the manuscript are outdated, please replace them.

Specific comments:

1. I apologize that I did not clearly find the location distribution of the actual points in Figure 1, the author should add this information in the text or in an additional file.

2. Why did you choose two meteorological datasets, the NCEP- NCAR reanalysis dataset and the CRUTS v. 4.07 dataset? Are they different in any way?

3. Line126: What is LIMA and is it the same as LWIA in Figure 2?

4. Line 134: The full name of ANOVA should be shown in its entirety the first time, and then the abbreviation is used in the later text, similar situation please ask the authors to solve it together.

5. Line123: Here it is H^1/H^2 at the beginning and δD later, are these two statements the same? Please harmonize the statements

6. Line142: What is the calculation method of RMSE and MAE?

7. Line146: 102862 should be written as 102,862, and other figures in the text should be written the same way.

8. The information in Figure 4 is vague and needs to be reformatted to improve the resolution.

9. According to Figure 1, the authors collected data for Antarctica, but this part is missing from the spatial distribution.

10. Line171: “The most pronounced variations occur in arid zones, underscoring the influence of climatic factors on stable isotopes of surface water.” Are the potential causes of such pronounced variations observed in arid zones explored?

11. Line185-194: Interpolation was performed here to map changes in spatial distribution, what interpolation method was used? This should have been explained earlier.

12. Figure 5 needs to be redone to improve resolution.

13. What is meant by SWL in figure 7, which should be explained in the text?