

Interactive comment on “The Global Network of Isotopes in Rivers (GNIR): integration of water isotopes in watershed observation and riverine research” by J. Halder et al.

Anonymous Referee #1

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SUMMARY:

The paper submitted by Halder et. al. has two primary objectives: i) to present the Global Network of Isotopes in Rivers (GNIR) database, and ii) analyze the spatial patterns of the data within the GNIR database. Because stable isotope values are an important tracer of the hydrologic cycle this database will be an important resource for future work. As such, both of the stated objectives are important and merit publication in HESS.

In their analysis of the GNIR database, the authors subdivide all long-term records

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into 3 groups and then further divide each group into 2 subgroups. The primary tool used to diagnose the characteristics of GNIR station data is through fitting a sinusoidal function to the time series of isotope data. An analysis of the isotope composition of precipitation and river water is also undertaken, and a good correlation is found between these two groups. Overall, I feel that the approach undertaken by the authors is interesting and a good contribution to the field. However, I feel that the description of the river classification system is poorly described and requires revision (perhaps major) to fully convey the approach to readers.

MAJOR PROBLEMS:

1: With respect to the first stated objective of this paper, I feel the data set is not described very well. I.e.: How is the data stored in WISER? Is data in a set of interlinked tables (like in MS Access) or do I have to download individual site separately and combine them? How is the meta data and associated water quality information stored and presented to users? This is a pretty easy thing to fix, just add a description of the data organization, storage, and access options.

2: My main concern with this paper is the description of the 'clustering' of the dataset into 3 and/or 6 groups. In both the text and the flow chart (Fig 1) supplied by the authors, the criteria for placing a specific station into group A, B, or C is completely unclear. Fig 1 states that the groups are 'snow and ice' (A), 'air temperature' (B), and 'Air temperature and atmospheric circulation' (C). However, nowhere is a temperature threshold specified (e.g. points below X deg C are in A while points between Y and Z are in B, and so on). Furthermore, the datasets used for 'air temperature' and 'atmospheric circulation' are not specified. It seems like the actual criteria used for separation into groups should be the amplitude and phase of the fit sinusoidal curve, but this is not stated. Or perhaps the criteria is the difference in phase of precipitation and river water isotope values. While figure 4 is useful, a similar plot of the phase shift with the groups specified should also be shown (similar to fig7?). Finally, a cross plot of phase and amplitude may be useful?

3: I think the approach that the authors have undertaken to fit a sinusoidal curve to each data set is a decent approach. However, the equation (2) should be rewritten such that values of the phase angle reflect the month of maximum value as is discussed in the text and in figure 7. Something like: $\Delta_{180} = A \cdot \sin(2\pi/12 \cdot (t + 3 - \theta))$ would do the trick. Also, nowhere is the possibility of bimodal precipitation or runoff mentioned. There are many locations known to have multiple wet seasons, or skewed distributions of precipitation. What are the consequences of this for your sin fit. Are there trends in the fit of the sin curve (i.e. better fit in cold or warm locations, etc. ...)?

SPECIFIC POINTS:

P4048L6: Are the phases periodic? I this wording is redundant

P4053L25: What is meant by 'poor spatial data coverage'?

P4054L4-19: This section is unclear (see point 2 above)

P4054L12: What temp data set is used here?

P4054L19-23: Since you use the phase and amplitude to subset your data, maybe you should introduce this first?

P4054L25: Seasonality has many definitions, what do you mean here?

P4054L27: Justify this station? How is this known?

P4055L19: The Hydro1K dataset is at fine spatial resolution, what is the catmint delineation limited to 500km²?

P4055L26: insert 'relative to GNIP'?

P4057L10: So this only applies to the northern hemisphere? Again, it seems you want to look at the difference between phases of preicp and runoff, this would be much less qualitative

P4058L3: 'charted'? reword

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P4058L4: What temperature is used. Is a value of temp included in GNIR?

P4058L10: In the previous page 2.0 was high, now you describe 1.9 as low? Perhaps relative to other members in this group?

P4060L10: How is this prediction made? From figure 8 it appears your only predicting the average, what info about variability is predicated?

P4060L20: This is not a cross plot of GNIP vs GNIR it's a cross plot of 18O v 2H.

P4060L24: From figure 4 the range of GNIP certainly increases however, is there a statistically significant trend in this data for GNIP or GNIR? No analysis presented and this statement is unsubstantiated.

P4061L11: Ok, so you state here how the clustering is done, by correlation of GNIP and GNIR? Then maybe a plot of the correlation coeff vs latitude or elevation or temp would be relevant. No correlation numbers are ever reported in this paper and this is only mentioned now?

P4071F1: This needs to be reworked. It is not clear what cutoffs are used to divide sites into groups A B and C.

P4072F2: The x-axis label is unclear. Why not just state 'number of isotope measurements at each site' or something like that?

P4073F3: A plot of phase vs. amplitude or phase vs. latitude or phase difference (GNIP – GNIR) vs. amplitude would also be useful.

P4077F7: Why not continue to use the same symbols as in Figs 3 and 4

P4078F8: Why not continue to use the same symbols as in Figs 3 and 4

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