

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2021-318

Anonymous Referee #2

Referee comment on "Diagnostic evaluation of river discharge into the Arctic Ocean and its impact on oceanic volume transports" by Susanna Winkelbauer et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-318-RC2>, 2021

This is an extensive study that compares observational river discharge data with global reanalysis data products from ERA5 and GloFAS for the assessment of Arctic rivers' freshwater contribution to the Arctic Ocean. The study further estimates the freshwater budget of the Arctic Ocean through a combination of observational river discharge data and global reanalysis data products. Overall, the manuscript brings valuable results and contributes to the continuous estimates of the river input and freshwater budget of the Arctic Ocean. The inclusion and evaluation of reanalysis data products are also valuable for future assessments. See also my general and specific comments listed below.

General comments:

The manuscript is well organized, but there are some spelling and grammatical errors that needs to be considered, including the use of commas and apostrophes. I also suggest to avoid using words such as "spurious", "huge", "clearly" etc., especially for the results and conclusions sections (see also specific comments).

Considering that previous studies focusing on the Arctic drainage basin have used different approaches and motivations for its geographical domain, I am missing a motivation for the chosen boundary of the Arctic Ocean drainage basin in this study, and why e.g., Hudson Bay, and James Bay was not included? (e.g., L302-305). Clarify also in L313 that total drainage area refers to the area for this study.

How do these reanalysis products take frozen components of the freshwater system into

consideration, e.g., glaciers and permafrost, considering that many of the river basins in the study are underlain by permafrost? For example, lines 497-498 includes an interesting aspect that I would like to see more elaboration on.

In the conclusions, I am missing a general discussion on implications for future studies and assessments of freshwater budgets of the Arctic Ocean.

Specific comments:

L12: I suggest to avoid the use of "spurious" and instead explain or reference to what you are referring to.

L37: consider removing "remarkably"

L41-43: Consider rephrasing for clarity and also specify the part on climatological conditions.

L45: avoid using "huge"

L47-48: Consider rephrasing for clarity.

L48-49: This is not very clear, please explain what you mean by “spurious” (see also previous comment related to this).

L92: Which 16 rivers were included in the study, and how was the shorter observational records treated for the analysis in comparison to the longer observational records?

L119-120: What about frozen storage components, such as glaciers?

L134: I suggest to add references to earlier studies, and revise “popular” to “common” – if this is what you are referring to?

I suggest to remove a, b, c in subheadings (e.g., L196, 205).

L244: consider removing “clearly”

Fig 4: Is this figure only considering the shorter time series of the 16 catchments, or for

the full time period (1981-2019)? Same question for figure 6 and the observed Pan-Arctic river discharge data.

L497-498: This is an interesting aspect that I would like to see more elaboration on.

L527: I suggest to include references here, and do you mean "common" rather than "popular"?

L528: How does this result compare to other studies?

L529: Runoff from ERA5 is substantially "too low" – do you mean "underestimated compared to observed discharge" or similar?

L531: Please consider rephrasing and describe the "unrealistic" aspects.

L548: What is considered "trustworthy" here – please explain.

L555: What is considered "reliable" – please explain

L559: What would be a full success here, please elaborate.

L560: revise month to months

L571: Please specify what you refer to with "in most reanalyses".

L572: Please specify what you refer to with "spurious signals".