Reviewer Comments: RC1: 'Comment on hess-2024-58', Anonymous Referee #1, 22 Apr 2024

This compilation of gridded climate datasets will likely be a useful resource for hydrologic modelers in selecting an appropriate data product. The authors conducted an extensive search for relevant products and summarize them, as well as studies that have conducted dataset comparisons in several tables. This meta-analysis again is a good resource but as it is currently presented is a list of resources with some explanatory information, rather than a true synthesis. Additional examples, citations, and synthesis of the dataset comparison papers would make a huge improvement to this manuscript. I recognize that each study site, modeling goal, and additional constraints mean that the final selection of datasets for an individual project will be variable and therefore the authors cannot reasonably make specific recommendations. However, I think readers could benefit from additional synthesis and examples so they could identify parallels in their own work and make better informed decisions on dataset choice, particularly in all subsections of section 3. I suggest the authors add more specific examples with citations to these paragraphs. Similarly, all parts of section 4 read like the authors are rattling off a list of findings from each of the studies rather than synthesizing them into a more cohesive narrative.

RESPONSE: The reviewer identifies the key limitation (and frustration!) of this study: "…each study site, modeling goal, and additional constraints mean that the final selection of datasets for an individual project will be variable and therefore the authors cannot reasonably make specific recommendations". Additional references/examples would also be subject to this limitation. We have tried to add more specifics, but the comparison methodologies employed by many of the studies are complex, and each one is different, such that multiple sentences would be needed to clarify each result, which would greatly increase the size of the paper and perhaps obfuscate the conclusions/recommendations. We welcome specific recommendations for improvement. Meanwhile, we have tried to enhance the paper more generally to address this identified limitation. Nonetheless, in response to this RC1 reviewer comment and a related RC2 reviewer comment, we tried to steer readers in the right direction by adding the following summary recommendation to both the Abstract and Conclusions: "Based on this study, the authors' overall recommendation is to select the gridded dataset (from Tables 1, 2, and 3) (a) having spatial and temporal resolutions that match modelling scales, (b) that are primarily (G) or secondarily (SG, RG) derived from ground-based observations, (c) with sufficient spatial and temporal coverage for the analysis, (d) with adequate latency for analysis objectives, and (e) that includes all climate variables of interest, so as to better represent interdependencies."

Additionally, I found no discussion of how the dataset assessment studies were found and evaluated to be included in this manuscript.

RESPONSE: The first paragraph of Section 4 describes the criteria used to include studies in the review. The search effort was considerable by both the first and second authors, with all authors contributing literature, and was ended when search terms identified redundant literature.

Minor Comments:

Line 22 of the abstract: confusing as written datasets of what? Temperature? How does this relate to the following sentence?

RESPONSE: Revised: "In mountainous regions as well as humid regions, reanalysis-based precipitation datasets generally performed better than ground-based when underlying data had low station density, but for higher station densities, there was no difference. Ground-based ~~precipitation~~ datasets generally ~~performed better~~ were more accurate in representing precipitation and temperature data than satellite- or reanalysis-based datasets, though ~~better precipitation and temperature datasets~~ this did not always translate into better streamflow modelling."

Line 34, need some citations

RESPONSE: We added some specific text to clarify the statement (see underlined text), and note Section 4 (Table 4), which provides citations and details of 28 recent studies that support this statement: "Many studies (28 of which are reviewed in Section 4 of this article) have intercompared… A search of "intercomparison" AND "gridded AND climate AND data" yielded 202 documents using Scopus. Excluding "climate change" reduced this to 100 documents, and excluding "CMIP" produced 77 documents.".

The introduction is very short, which I think is fine for this manuscript, but I do suggest that some of the more introductory information in section 2 (particularly the first paragraph) be moved to the introduction to make a slightly more comprehensive introduction.

RESPONSE: Rearranged as suggested. First paragraph of Section 1 was split, and the first paragraph of Section 2 was inserted.

Line 97 – more direct, don't need hyphen.

RESPONSE: APA Style Guide: "In a temporary compound that is used as an adjective before a noun, use a hyphen if the term can be misread or if the term expresses a single thought (i.e., all words together modify the noun)." This doesn't seem to be easily misread, but the two terms do not independently modify the noun ("more measure" doesn't make any sense without "direct"). Since the APA rule is "or", a hyphen would be indicated, though I have no problem omitting it, at the editor's discretion.

Figure 1- This figure is very poorly made and, in my opinion, not of publication quality.

RESPONSE: Agreed. Figure 1 was upgraded.

Line 210 – Latency should be defined much earlier in the manuscript than here.

RESPONSE: In the first paragraph of Section 1 (now the third paragraph), we briefly defined the latency term: "…gridded datasets often are not available in real-time (i.e., data latency)…". Is this sufficient?

Line 236 – The fewest? Can this be supported with a % or n?

RESPONSE: Yes, thanks. The prior version of Figure 4 showed this explicitly. Clarification added: "(only 1 of the 28 studies in Table 4)".

Line 248-249, I would include snowpack in this list

RESPONSE: Agreed, added.

Reviewer Comments: RC2: 'Comment on hess-2024-58', Anonymous Referee #2, 21 May 2024

This manuscript compiles many meteorological forcings datasets and provides an overview, which has certain reference significance for modeling research. However, I think the narrative in the article needs to be further improved.

Major Comments:

Introduction. The descriptions are too simplistic in this manuscript. (e.g., "Many studies have intercompared the accuracy of particular subsets of these gridded climate datasets for various regions, settings, and time frames across the globe with various insights and conclusions."). More citations are needed to support your opinion and illustrate with specific examples.

RESPONSE: The Introduction was reorganized and revised in response to this comment and another from Reviewer 1. For the example noted above, we added some specific text to clarify the statement (see underlined text), and note Section 4 (Table 4), which provides citations and details of 28 recent studies that support this statement: "Many studies (28 of which are reviewed in Section 4 of this article) have intercompared the accuracy of particular subsets of these gridded climate datasets for various regions, settings, and time frames across the globe with various insights and conclusions. A search of "intercomparison" AND "gridded AND climate AND data" yielded 202 documents using Scopus. Excluding "climate change" reduced this to 100 documents, and excluding "CMIP" produced 77 documents. Even with these filters, most studies focus on a limited number of datasets, lack generalizable recommendations, and do not consider the functional implications of dataset limitations on end-users' hydrologic analysis. The present study aims to provide a comprehensive compilation, overview, and considerations for selection of gridded datasets with focus on selection for hydrologic modelling and analyses. Our focus is on historical datasets (not climate projections) at the conterminous U.S. (CONUS) to global extents."

Minor Comments:

Abstract. The manuscript can summarize the advantages of this work, for example, including the situation of previous research, and the innovation of this research.

RESPONSE: The following summary recommendation was added to both the Abstract and Conclusions: "Based on this study, the authors' overall recommendation is to select the gridded dataset (from Tables 1, 2, and 3) (a) having spatial and temporal resolutions that match modelling scales, (b) that are primarily (G) or secondarily (SG, RG) derived from ground-based observations, (c) with sufficient spatial and temporal coverage for the analysis, (d) with adequate latency for analysis objectives, and (e) that includes all climate variables of interest, so as to better represent interdependencies."

Figure 1. This picture needs further beautification. In addition, some explanation should be added in the title of the figure, Such as "Spatial Coverage: Land=Global land surfaces only (not ocean surfaces).".

RESPONSE: Agreed. Figure 1 was upgraded, and figure caption was expanded to define abbreviations.

Section 3.3. The spatial and temporal resolution of evapotranspiration, runoff, and other hydrological elements is relatively high (100m-1km, hourly; Melsen et al., 2016). The resolution of gridded climate datasets should be an important criterion to consider. In my opinion, the resolution of the hydrologic model is limited by the spatial and temporal resolution of climate datasets. Hence, the manuscript should clarify the significance of high-resolution gridded climate datasets for numerical simulation, especially for reducing uncertainty in simulation.

RESPONSE: Thank you, nice comment. We expanded the text, accordingly: "The simulated spatial and temporal resolution of evapotranspiration (ET), runoff, and other hydrological elements in hydrologic models can be relatively fine (<1 km, subdaily), and model resolution is increasing in ways that capitalize on increasing computational power, process understanding, and data availability (Melsen et al., 2016). Hydrologic model output resolution and uncertainty are often limited by the spatial and temporal resolution of climate datasets. As such, the resolution of gridded climate datasets should be an important criterion to consider."

Reference: Melsen LA, Teuling AJ, Torfs PJJF, et al. HESS Opinions: The need for process-based evaluation of large-domain hyper-resolution models[J]. Hydrology and Earth System Sciences, 2016, 20(3): 1069-1079.