

Interactive comment on “GloFAS-ERA5 operational global river discharge reanalysis 1979–present” by Shaun Harrigan et al.

Anonymous Referee #1

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In this paper, the authors reported a newly developed river discharge dataset at the global scale using a meteorological reanalysis dataset and evaluated its performance. Since this river discharge dataset is very promising in terms of high resolution (0.1 degree) and feasibility for real-time update, it will benefit potential users among hydrology and related-field communities. The contents of this paper are also suited for this journal. This paper is well organized. But there is some room for improvement before publication. In particular, since this paper targets a new release of river discharge data and is intended to be published in the journal specialized for scientific data, methods and processes used in producing the dataset should be solidly and clearly written.

MAJOR COMMENTS

Figure 1: Since the spatial resolution of LISFLOOD (0.1deg) is finer than that of ERA5
C1

runoff data (0.28125deg), I guess a kind of downscaling techniques was used to produce the LISFLOOD dataset. However, there is no information (except “been resampled” in L138) on this process in this paper. How did the authors produce runoff data at a finer resolution in this paper? Did the authors weight the ERA5 runoff value (by something) during the “resampling”? Did the authors consider terrain effects within an ERA5 cell in allocating surface/subsurface runoff to multiple 0.1deg land cells? Please provide the procedure in detail.

Sect. 2.2 and Figure 1: The authors describe surface and subsurface runoff data originally generated from the HTESSEL land model. I think the runoff scheme directly affects the river discharge data, but less information about it is provided. To which depth of soil layer did the authors consider as the subsurface runoff? Regarding the description in L125-127, how much delays were considered before the subsurface water returns back to the river channel in the LISFLOOD ground water module? Does it depend on the soil properties?

L132-135: The authors describe flow alteration by lakes and reservoirs, but readers cannot figure out how much the flow is altered by them. Did the authors use a kind of algorithms of flow alteration or dam manipulation? The authors also discuss the limitation of this dataset as “While GloFAS-ERA5 reanalysis does represent major dams and reservoirs on the modelled river network, it does so in a simplified way and does not include operational operating schedules for individual structures. (L298-299)” in a later section, but due to the lack of description on dam operation schemes employed in this paper, it is very difficult to have a clear image on that. What does “a simplified way” mean? In addition, how the authors treat river water withdrawal from rivers for human activities (agriculture, industrial, etc.) in this dataset? Please provide information about it in detail.

Sect. 4.3: The authors provide monthly performance of this dataset. Such information is very useful, however, it is very difficult to interpret this seasonality, because the results are (probably) a mixture of contributions from both the northern and southern

hemispheres. Have the authors made similar analysis for each hemisphere? The authors state “Attribution of such biases in the GloFAS-ERA5 reanalysis is outside the scope of this data paper (L293)”, however, practical information on the seasonal performance of this dataset will be very beneficial for potential data users. In my view, the authors should add and show, at least, whether a larger bias ratio observed in the months of November to March than the other months (Fig 7c) is attributable to winter discharge from the northern hemisphere or summer discharge from the southern hemisphere (or a mixture of them; or from some specific regions).

MINOR COMMENTS

L139: Is a one-year spin-up enough for this simulation? Probably this depends on the groundwater module or dam operation schemes (the information is not clearly written in the current manuscript, though) used in this model.

L191: The authors used “1801 catchments” here, but this expression might be confusing if there are multiple gauge stations in a large river system. I think dividing this sentence into two parts (and used “1801 stations” in the former one) will be clearer for understanding.

Sect. 4.2: The authors discuss the results by using both the bias ratio (beta) and PBIAS, but this might be confusing. For example, “-9%” in L241 is PBIAS, due to its negative value, I guess.

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