Dear Dr. Ge Peng,

We thank you for your handling this manuscript and all the reviewers for their comments. We have addressed every reviewer comment and revised the manuscript accordingly. Reviewer 2 had only minor comments which we addressed directly. Reviewer 3 had one additional concern about our comparison to the HydroSHEDS dataset. We have added text to the revised manuscript to clarify our choice of NHDplus over HydroSHEDS and have also highlighted the extensive comparisons to existing datasets that we have provided throughout the manuscript. Reviewer comments are shown in black and our replies are in blue. We think that the comments helped us to improve the manuscript and we look forward to hearing your decision.

Best regards
Jun Zhang
(On behalf of the co-authors)

Reviewer #1:

1. Line 50, add 'use'
   Reply: added to the manuscript.
2. line 79: delete Digital Elevation Model
   Reply: deleted in the manuscript.
3. Line 81: This is defined as CONUS in the previous paragraph. I suggest to keep using CONUS.
   Reply: changed in line 89 of the revised manuscript the manuscript.
4. Line 97: delete 'the'
   Reply: deleted in the manuscript.
5. Line 114: Some components are missing from this sentence.
   Reply: Thanks for pointing this out, the sentence has been changed in line 123 of the revised manuscript to
   '*For the more arid endorheic basins, such as are commonly found in the Great Basin of the western US, intermittent rivers drain to much smaller water bodies which may not be perennially inundated.*'
6. Line 120 caption of Figure 1: change 'datasets' to 'dataset', add 'hydrographic'
   Reply: changed the caption of Figure 1 in the manuscript.
7. Line 124: add 'to'
   Reply: added to the manuscript.
8. Line 115,125, 134, 136, 147, 153, 154, 157, 177, 228, 233, 249, 381, 398, 401, 406: add ','
   Reply: added to the manuscript.
9. Line 140: This sentence is not clear.
   Reply: Thanks for pointing out this. The sentence has been changed in line 150 of the revised manuscript to
   '*A larger stream burn is not necessary because the later processing steps ensure that the processed DEM reflects the channel network.*'
10. Line 142: Corrupted sentence.

Reply: Thanks for pointing out this. The sentence has been changed in line 151 of the revised manuscript to

'*We would like to emphasize here that this stream burning step is very small, and it is not intended to control the final stream elevation, but just to provide some information on stream location.*'

11. Line 149: change 'preserve' to 'preserving'

    Reply: Thanks, but we think here should use 'preserve' as it is 'to preserve'.

12. Line 167: does 'epsilon value' mean 'height' here?

    Reply: Yes, 'epsilon value' is an optional value to be added to the upstream cells. We have changed in line 178 of the revised manuscript to

    '*Additionally, the user can specify an optional epsilon height to be added to cells' elevation as they are processed by the algorithm.'*

13. Line 178: change 'decrease' to 'decreasing', change 'improve' to 'improving'

    Reply: Thanks, but we think here should use 'decrease' and 'improve' as it is 'to decrease' and 'to improve'.

14. Line 179: add 'performance'

    Reply: added in line 188 of the revised manuscript.

15. Line 180: Not clear. What purposes?

    Reply: The purpose is to smooth the slope along the streams. The sentence has been changed in line 189 of the revised manuscript

    '*We first derive a new stream network to be used for the stream elevation smoothing, using a drainage area threshold (stream_th).*'

16. Line 205: Not sure why however was used here.

    Reply: Thanks for pointing out it here. 'However' is used here because we provided a single primary flow direction for each grid but calculated slopes in both x and y directions.

17. Figure 2: I don't understand the writing of point 3.

    Reply: Apologies for the confusion, this step is to ensure the elevation of bank cells is at least 'bank_epsilon' higher than the downstream cells. Point 3 has been changed to

    '*Re-evaluated all cells draining to streams traversing up the bank as needed to ensure all cells are at least bank_epsilon higher than their downstream neighbor.*'

18. Figure 2: Use either solid dot or alphabet.

    Reply: Apologies for the inconsistency, has changed to solid dots.

19. Figure 2: remove "is high"

    Reply: removed in the figure.

20. Line 230, remove ','

    Reply: removed in the manuscript.

21. Figure 8: I think a better way is needed. It is hard to identify the difference.

    Reply: Thanks for point out the issue. We have added zoomed figures of the boxes in the figure as shown in Figure 8 to present the difference more clearly.

22. Line 400, change 'however' to 'However.'

    Reply: Changed in the manuscript.

23. Line 403: corrupted sentence.

    Reply: Thanks for pointing out this. The sentence has been changed in line 413 of the revised manuscript to

'*Comparing the No Smooth to the Add Stream Smooth cases, it can be seen that the stream smoothing step has the largest impact on the ponding depths in the stream. Figure 9 illustrates that it significantly reduces the ponding depth variability from cell to cell.*'

24. Figure 9: Make the line longer. It is hard to identify the color difference. Maybe to use green to replace either blue or magenta.
    Reply: Figure 9 has been modified accordingly.
25. Line 432: delete 'that'
    Reply: removed in the manuscript.
26. Line 443: change 'between the final resulting DEM presented here' to 'between the final DEM of this study'
    Reply: Changed in the manuscript.
27. Line 444: I don't understand the writing.

Reply: Thanks for pointing out this. The sentence has been changed in line 452 of the revised manuscript to

'*DEM Adjustments are split into two categories according to the processing step where they occurred (1) the priority flood adjustment step where elevations were adjusted to ensure complete drainage and (2) the subsequent smoothing steps.*'

Reviewer #3:

The manuscript presents a topographic dataset for the contiguous US., which can be used for a wide range of applications, especially for hydrological modeling. Then authors applied a set of methods to solve the issues that can affect the water flow prediction. Although these methods can hardly be considered as innovative, it seems that they do addressed many of the issues that commonly run into when deriving the topographic variables from a DEM, and produced a good quality dataset. The authors present the methodology in great detail and the manuscript is written very well in general. I have three comments, hoping the authors could address them before publication:

Reply: We thank the reviewer for the positive comments. We aim to provide a useful topographic dataset that can be applicable in many hydrological models. The scripts for the DEM processing and smoothing are also provided along with datasets, so researchers can apply it in other regions and resolutions.

1) The authors use the term "high-resolution" in the title and highlighted it through the manuscript. I think it can be a little misleading, because the dataset is in 250 mand 1 km resolutions, and neither can be considered as high-resolution as today's standard. While 30 m resolution has been considered as a moderate resolution in many publications, it seems unreasonable to me to label a 1 km resolution dataset as high resolution.

Reply: We appreciate the reviewer's perspective here. We agree that 'high' resolution is subjective and that with respect to local modeling and DEM products 250m and 1km may not be considered high resolution. For national scale models we would contend that 1km is still high resolution. Still, as this is subjective, we have removed the term from the manuscript and title.

2) DEM has been used as the main input for producing the topographic variables. I think it needs to be clarified what the adopted DEM dataset represents. Does it represent the bare ground or get affected by tall vegetation?

Reply: Thanks for pointing this out. We started from a 250m DEM developed for the NWM V1.2, which was developed from the 30m National Elevation Dataset. The DEM is the elevation of bare ground without considering the tall vegetations. This is clarified at Section 2.1 (Line 100 in the revised manuscript).

3) I noticed that the authors failed to address one of the comments from another reviewer regarding comparing to other datasets, especially regarding HydroSHEDS. I think it is critical to provide such a comparison to clarify the improvement over the existing datasets, especially these have been widely used globally.

Reply: We agree that HydroSHEDS is an important global dataset and warrants some discussion here. We added it to our introduction in the paragraph copied below. In our analysis we chose to start from NHDplus as opposed to HydroSHEDS because NHD plus has been more thoroughly evaluated for the US specifically. Previous work has compared HydroSHEDS with NHD and we feel it is outside the scope of our paper to do a national DEM intercomparison here. However, we have added clarification to explain our reasoning for choice of input datasets and to differentiate between NHD and HydroSHEDS. Also, we would like to highlight that we do have direct comparisons of our processed datasets to the datasets that we started from. For example, in figures 3 & 4 where we highlight the differences in drainage networks that result from our hydrologic processing relative to NHD. Additionally, in Figure 12 we summarize all of the elevation differences that occur relative to our starting DEM from our processing steps. All of our runoff tests and additional analyses are meant to highlight the benefits that come from our processing steps.

The discussion added in the manuscript in Line 68 in the revisied manuscript is copied below:

'*Finally, the Hydrological data and maps based on SHuttle Elevation Derivatives at multiple Scales (HydroSHEDS) provides hydrographic information for global scale applications. It offers a set of hydrological datasets, including river networks, watershed boundaries, drainage directions and flow accumulations at ~90m resolution based on a high-resolution elevation data from NASA's Shuttle Radar Topography Mission (SRTM) (Wickel et al., 2007). HydroSHEDS does include a hydrologically conditioned DEM derived through a series of processing steps, including stream burning, 'weeding' of coastal zones and sink filling, as well as river and flow direction layers similar to NHDPlus (Lehner et al., 2006). Previous studies have compared NHD to HydroSHEDS within the US and have shown that NHD has a more complete drainage network (Guth, 2011). Here we stick with the NHD dataset because it has been developed and more rigorously evaluated for the US specifically, and because it has already been mapped to the USGS stream gauge network (David et al., 2011).*'