Response to Reviewer # 3
Review of hess-2013-294 A Large-Scale, High-Resolution Hydrological Model Parameter Dataset for Climate Change Impact Assessment for the Conterminous United States

Research efforts presented in the paper focus on the generation of a comprehensive hydrologic model parameter dataset for climate change assessment studies. Various data sets were organized and re-gridded to 4 km grids. The effectiveness of the compiled dataset was tested over the conterminous US using the VIC hydrologic model, where the later was calibrated using USGS provided monthly runoff observations.
Major comments: It is an interesting, well written and structured paper that is easy to follow and understand. Generating and organizing such a detailed dataset of hydrologic parameters would certainly be beneficial for the research community; however, there are several major issues that have to be addressed before the paper can be considered for publication:

We would like to thank the anonymous reviewer for his/her comments and constructive criticism, which we believe have led to an improved manuscript. Below are specific answers to reviewer comments.

Not clear how the current study relates to previous work done in the area. Authors list several alternative datasets that provide similar information; however, very little is done to demonstrate the advantages of the dataset proposed here over the other alternatives, its accuracy and validity, etc. The manuscript needs more solid discussion, supported with proper references, on what was done previously and how the work proposed here builds on this previous knowledge.

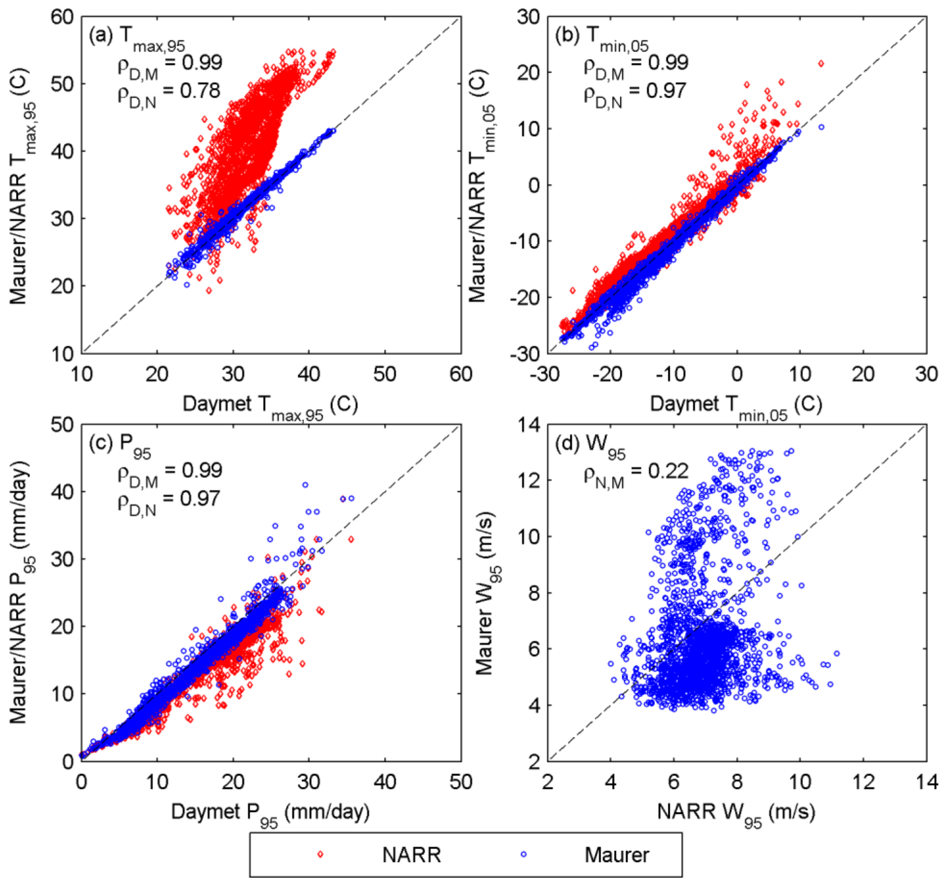
(Below is the same response to Reviewer #2, comment #2)

It is well documented in previous studies that runoff is sensitive to spatial variations in soil properties, precipitation inputs, and topography (Haddelenad et al., 2002; Nijssen et al., 2001, Sharif et al., 2007; Dooge and Bruen, 1997; Merz and Plate, 1997; Shah et al., 1996; Wolock and Price, 1994). Additionally, high-resolution land hydrology is needed to address questions such as identifying climatic controls on the spatial variability of hydrologic parameters and the scale at which they are most dominant; examining the spatial scaling properties of the hydrologic parameters; performing statistical analysis between climatic variables and land surface processes and states, such as soil moisture and evapo-transpiration (ET); and developing subgrid parameterization approaches for the hydrologic parameters, particularly in the wet and dry conditions.

Another motivation of this study is, however, not simply to reconstruct the past observations at higher resolution, but rather to be able to evaluate the effects of long-term changes in extreme hydrologic events, for which an evaluation can only be conducted through refined spatial resolution. Moreover, it is necessary to accurately predict spatial variations in watershed hydrology at the subbasin scale in order to identify regionally specific management strategies to mitigate the potential impacts of climate changes on water resources at the regional scale.

Authors have stated in the manuscript that it is hard 'to fully judge which dataset would be the closest to' reality (pp. 9582, lines 2-5) and randomly select the DAYMET as a reference, which raises concerns regarding the overall accuracy of the datasets and the validity of the analysis *performed here. Proper discussion focused on the quality of the datasets and intercomparative analysis should be added.*

We appreciate this comment. This concern was also brought up by reviewer #2. We would like to clarify that DAYMET was not randomly selected. Instead, DAYMET is considered to be the most appropriate choice given its finer (1km) resolution. As shown in the new result (Fig. 4), the resolution of dataset is critical for extreme precipitation. Given that Maurer was originally in 12km and NARR in 36km resolution, it is unlikely that the precipitation can be faithfully reconstructed at 4km resolution. We have added Daly et al. (2008) in the revised manuscript to describe DAYMET's limitation.



New Figure 4 in the revised manuscript. Comparison among the 1980–2008 DAYMET, Maurer, and NARR (a) mean annual 95% quantile daily maximum temperature $T_{max,95}$, (b) mean annual 5% quantile daily minimum temperature $T_{min,05}$, (c) mean annual 95% quantile daily precipitation P_{95}, and (d) mean annual 95% quantile daily wind speed W_{95}. Each point represents the HUC8 annual average over the entire period.

Minor comments: There are nine 4 km grid points within the 12 x 12 km grid. Not certain why the computational time increases to 'more than 10 times' when from 12 km to 4 km grid (pp 1850, paragraph starting on line 9).

This confusion was brought up by multiple reviewers, and it has been clarified in the revised manuscript. We agreed that the 1/24° grids would result in exactly 9 times the computational resources when compared with the 1/8° grids. However, given the expanded data flow, there will be some additional computational demand for data management and quality control, which were not required for the simpler 1/8° grids.

pp. 9580, paragraph describing the meteorological forcing; pp. 9581, paragraph starting on line 4 – believe there is some terminology mixing – all the weather related parameters are measured by specific instruments and are not 'gauge observations'.

We appreciate this comment. It has been corrected in the revised manuscript.

There are several statements made in the paper that are not supported by proper analysis or references: i.e. statement regarding the PRISM product, pp. 9581, lines7-8, and elsewhere.

We appreciate this comment. It has been corrected in the revised manuscript.

Overall the paper reads easily, however there are several grammatical issues that have to be addressed; pp. 9581, line 23: processed in -> processed to; missing definite articles, etc.

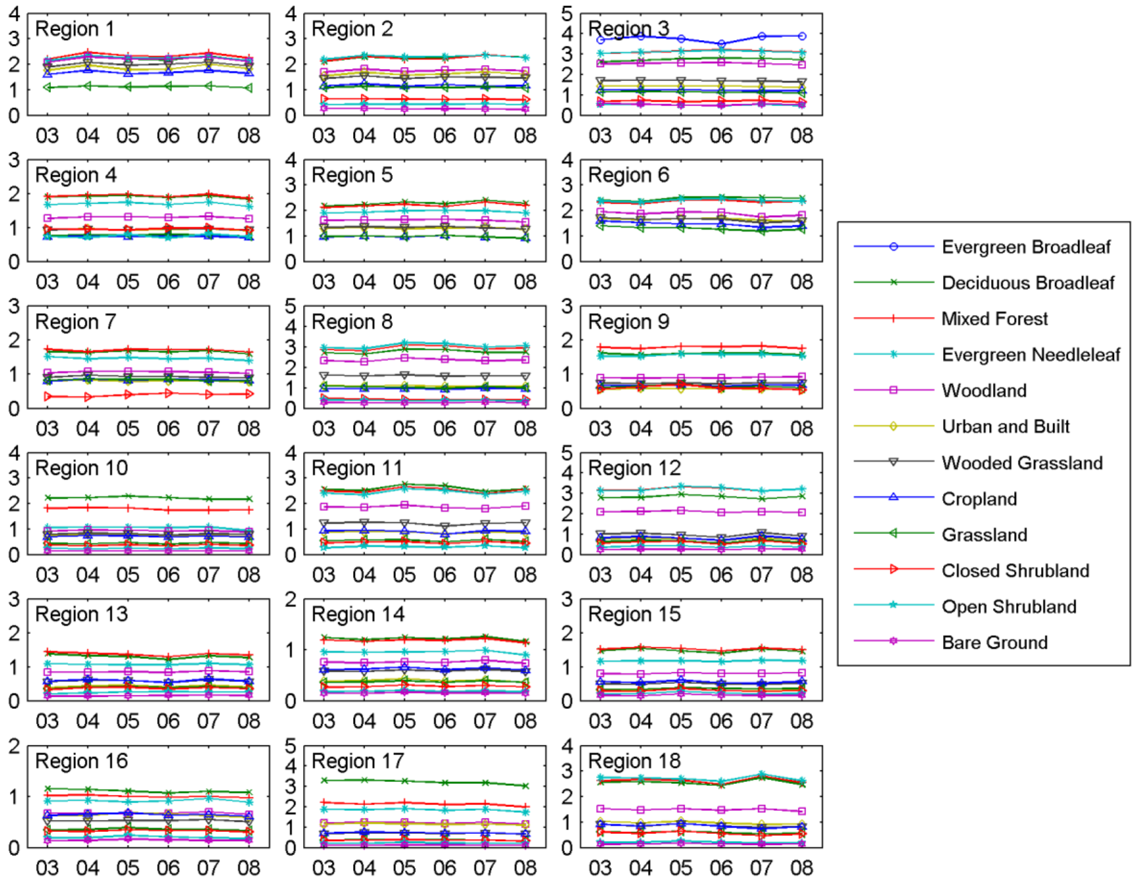
We appreciate this comment. It has been corrected in the revised manuscript.

pp. 9582, lines 5-6: "for non-US region" – authors clearly state on several occasions very early in the paper that the study area is limited to the conterminous US. Please, explain.

The non-US regions refer to the headwater basins that flow into the conterminous US (e.g., British Columbia). It is now clarified in the revised manuscript (Sec. 2.1) that the data in the non-US region will be collected (as a space holder), but the simulation and calibration will be conducted in a future study.

pp. 9591, lines 12-15: the reviewer assumes that the authors refer to generating and using 'monthly' average LAI values; there might be no annual variability but there is a clear seasonal signal in the LAI times series. Please, clarify.

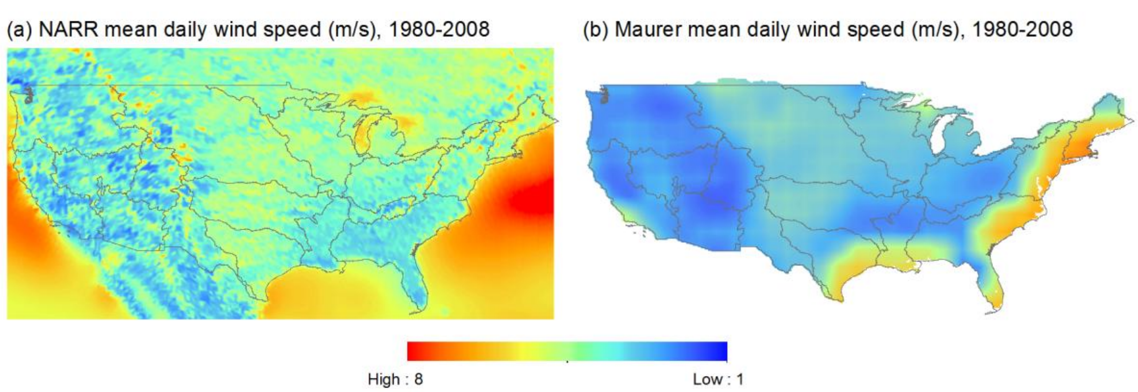
We appreciate this comment. The original statement has been revised for clarity. A new figure (Fig. 7) has also been added in the revised manuscript to show the annual average LAI from 2003 to 2008 for each US hydrologic region. Please see the response for reviewer #4 for more details.



New Figure 7 in the revised manuscript. Summary of MODIS leaf area index (m2/m2, y-axis) from 2003 to 2008 (x-axis) by the UMD land cover classification for each US hydrologic region.

It is recommended that all the maps included in the manuscript represent the same areal extent, i.e. the conterminous US, and are plotted using the same projection. Also, Fig. 2 has a km scale bar included; Fig. 4 is plotted using a regular lat/long grid frame; Fig. 8 has no geo information. Please, be consistent.

Fig. 4 (now Fig. 5) has been replotted for consistency. To save some space, we decided to omit the geo information in Figs. 4 and 8 (now Figs. 5 and 11) since the scale of the conterminous US should be quite familiar to the readers.



New Figure 5 in the revised manuscript. Maps of mean daily wind speed.

Additional References

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