

Comment on **essd-2021-420**

Anonymous Referee #2

Referee comment on "A Central Asia hydrologic monitoring dataset for food and water security applications in Afghanistan" by Amy McNally et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-420-RC2>, 2022

Dear Editor and authors,

The work by McNally and others describe the FLDAS system tested in Afghanistan, focusing on snow water equivalent for a particular dry period (2018). There is no doubt about the significant advances observed with the use of NASA's LDAS over the years. However, I found this paper rather weak and upon my evaluation. In addition, the manuscript is also presented weakly and confusing. Hence, I am sorry to recommend "rejection with invitation for resubmission" in this case. Here are the key points I based my decision on:

1. Title: The title is misleading since the majority (if not all) the content focuses on Afghanistan. I would've been okay if the title was "A Hydrologic Monitoring Dataset for Food and Water Security Applications in Afghanistan" instead. I do appreciate the fact the system is setup for both globally and for Central Asia domain, but there are no tests to corroborate its performance outside Afghanistan presented in the manuscript
2. Abstract: The abstract is written quite general with results being presented rather vaguely
3. Introduction: It is rather unusual to begin a section with the figures without any context
4. Introduction: The section lacks a proper introduction within a broader context and motivation, both in terms of the region and in terms of efforts to predict land surface variables with modeling and remote sensing products

5. Section 2.2: Precipitation is mentioned as the most important input. However, I found the authors could have done a better job to compare with multiple products (e.g., ERA-Land, MSWEP, and others). The comparison seems rather limited. It also gives the impression that precipitation is the only meaningful forcing to compare against other products. I'd assume temperature and radiation would play a role as well, especially if the focus is on getting snow water equivalent predictions. Why haven't the authors compared other forcing variables? How do we know they perform well in Afghanistan?

6. L194-195: How did the authors find GDAS and CHIRPS appropriate? Any preliminary tests they had carried out? Can the authors be more specific here?

7. L199-200: The authors indicate that daily CHIRPS data need to be converted to sub-daily. There are other global products which are already sub-daily. Have the authors considered using those to bypass any further temporal disaggregation steps which could further introduce errors?

8. Section 3.1: Perhaps I am naive with the FLDAS system but how does comparing gridded precipitation gives an indication of performance of the system. My understanding (and I can be wrong here) is that FLDAS is an uncoupled system relative to the atmosphere, so precipitation is forcing/input variable rather than diagnostic or prognostic. Can the authors clarify why the comparison is needed and how they can link with the performance of their system?

9. Figure 4 and Table 2: Linear correlation coefficient (R) at monthly and annual scales are expected to give relatively good performance and mainly tracks the seasonal and major year-to-year variability, respectively. Since the authors stressed the sub-daily aspect of the product, how does the system compare with other daily and sub-daily precipitation products over Afghanistan? In addition, there is no metric referring to magnitude of rainfall as R relates mainly with this coarse temporal dynamics. The authors should consider looking at some "residual" metric (MAE, RMSE, MSE, ...)

10. Figures 5 and 6: Notice that up until this point, the reader has no idea about the location of these Afghan basins (no map is presented). In addition, there are not a single evaluation metric presented/discussed in this sub-section, the interpretation of the results seems to be only visual.

11. I found the example of application 2017-2018 wet season only for Afghanistan to be very limited when disseminating the global and Central Asia product as claimed by the authors. This example does not cover all aspects of a comprehensive evaluation and assessment of the performance of this system. How do we know the system works for normal years or anomalous wet periods? How about for other regions outside Afghanistan domain. I think it is very dangerous to extrapolate such limited results to larger domain and to other hydrometeorological conditions. I also found it strange the fact that impacts of drought on agriculture are mentioned by the authors but no analysis of soil moisture

from FLDAS is provided directly to the readers. The authors should present a much more thorough assessment in my opinion.

12. Figure 10: Notice some of the text in the figure is too small to read.