

# ***Interactive comment on* “Evaluation of Multiple Climate Data Sources for Managing Environmental Resources in East Africa” by Solomon H. Gebrechorkos et al.**

## **Anonymous Referee #1**

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**General Comments** This paper compared different rainfall datasets over East Africa that have 30+ year record, to station data in Ethiopia, Kenya and Tanzania. The authors found that the CHIRPS rainfall and the ORH Tmin/Tmax are the best products to use for long-term climate studies (trend, variability, and extreme indices) and input for climate or hydrological models.

While I think this paper is a good start to necessary analysis of daily rainfall products, I have concerns with the lack of independent station data and the narrow scope of the research (results are only regionally relevant, not very generalizable). I think there are ways to work around this problem of data validation in sparse-regions but the authors

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would need to reframe the paper and consider how to address the greater challenge of evaluating the quality of satellite rainfall in data sparse regions. The authors also need to be more transparent/detailed about their methods (metrics and data sets).

## Specific Comments (Major)

The focus on daily rainfall is useful/novel as the authors state that this has not been done before. In general this is a regional study that has limited applicability to studies beyond Ethiopia, Tanzania and Kenya, and to the extent that this is generalizable in country in questionable judging from Figure. 1. Not to say that research can't be done in data sparse regions but it has to be framed appropriately, and think that the authors could improve in this respect. In fact, "how to evaluate rainfall and temperature in a data sparse region?" is a good question, although i don't think comparing to a handful of stations that are not independent is necessarily the answer.

Major concern is the use of the EMA and GSOD data for evaluation and the conclusion that CHIRPS is the best performing product. I do think that CHIRPS is a very good product (from prior monthly/season scale evaluations and performance in hydrologic models & compared to other remotely sensed data), and it does need to be more carefully evaluated at the daily timestep.

The station data that goes into the different rainfall products needs to be described in the methods/data. In addition to the discussion. CHIRPS includes stations from several sources including GTS and GSOD, ARC includes GTS. Please include information on what stations the other products blend in. The authors indicate that GSOD is only used in the CHIRPS monthly totals making the "dependency rather weak and indirect" Seems to me incorporating GSOD would contribute to the strong monthly correlations in Figure 4. From my interpretation of Funk et al. (2015) the GSOD data is included for pentad-totals as well. You may want to ask the data producers to clarify (and then include that information in the data/methods here. I\* think\* Ethiopia NMA stations are included in CHIRPS. Check with the date providers Funk et al. 2015 says: "Addi-

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tional observations have been provided by national meteorological agencies, primarily in Mexico, Central America, South America, and sub-Saharan Africa” apparently ORH also uses GSOD “assimilating quality-controlled and gap-filled Global Summary of the Day (GSOD) in situ measurement” ...what spatial interpolation method do they use?

Evaluation of daily rainfall for trend/variability/extremes/hydro model input is a worthwhile goal. Also not sure if the authors accomplished this given that i have questions about their metrics. I understand that you are comparing to stations but... Daily rainfall intensity: intensity is depth per unit time. How are you getting this when you just have daily totals? And then how does the “intensity” metric differ from what you describe as daily totals? Please include your definition of intensity. Number of wet/dry days: is this just a count that does/does not match the stations? Or are you using something like probability of detection and false alarm rate? These metrics need to be defined in the methods. I can’t really tell what you did to come up with the results on page 13. Not obvious what “point to area-grid-cell” average means. I gather that its the average over the polygons shown in Figure 1, but this needs more explanation in the methods. Where do these polygons come from? Is there a reason why this level of basin was used to define the watersheds for a country? Since you’re not comparing to hydrological/streamflow data why not just average from 0.05 to 0.25 degree - essentially producing the same results as what you discuss with the coarser CHIRPS data?

Specific comments (Minor)

Additional information on how the data is produced should help explain your results (e.g. why is point to area-average best, does this have to do with the interpolation schemes that ARC and CHIRPS and the other product use? Do CHIRPS results improve at 0.25deg because that is its original resolution, before being downcaled to 0.05deg with the CHPclim? This kind information will be useful for the other products as well.

Is only a historic record needed for env. Management? ORH isn’t updated regularly

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(2012?) This should be clear in the paper, pls include in methods. Meanwhile, ARC & CHIRPS are updated regularly. It will help contextualize the metrics if you discuss the products strengths and weaknesses more with some example of an environmental management application that they might be used for. I am sure there are some that would benefit from ORH long record, or ARC's 1-day latency. If you are including OHR why not include what they use routinely in the Africa Flood and Drought monitor? 3B42RT...how does blending datasets impact the application to environmental management? With respect to hydrologic modeling GLDAS (Rodell et al. 2004) uses ORH/Princeton+other, Africa flood and drought monitor (Sheffield et al. 2014) uses ORH/TRMM-RT, FLDAS (McNally et al. 2017) uses CHIRPS. How does all this relate to the climate models? > intro was vague and too focused on data scarcity - we have lots of data (models, remote sensing, some in situ)...just not lots of dense rainfall stations. > there are lots of datasets to get temperature (e.g. MERRA-2, CFS-R). Why weren't these included?

Technical corrections > fix citation (also 2017): Kimani, M., Hoedjes, J. and Su, Z.: Uncertainty Assessments of Satellite Derived Rainfall Products, , 15 doi:10.20944/preprints201611.0019.v1, 2016. Don't cite the pre-print use this one: Kimani, Margaret Wambui, Joost CB Hoedjes, and Zhongbo Su. "An Assessment of Satellite-Derived Rainfall Products Relative to Ground Observations over East Africa." Remote Sensing 9.5 (2017): 430.

Typo RFE pg 6...its RFE Rainfall Estimation Version 2 (REF 2.0) (Novella et al., 2013)

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-558>, 2017.

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