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Comment on essd-2021-186

Anonymous Referee #1

Referee comment on "A 1□km global dataset of historical (1979–2013) and future (2020–2100) Köppen–Geiger climate classification and bioclimatic variables" by Diyang Cui et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-186-RC1, 2021

Cui et al. present Köppen-Geiger climate classification maps for ten 30-yr historical periods between 1979-2017 and future periods under different RCP scenarios. The historical maps were derived from combinations of 3 global temperature products and 3 global precipitation products, while the future maps were derived from bias-corrected CMIP5 projections. The authors claimed that their maps can capture recent and future changes in spatial distribution of climate zones. This dataset is useful and relevant for wide audience, but there is an important issue that have to be addressed before publication:

The authors compare two maps for 1980-2009 and 1987-2016 in Fig. 11. However, according to Table 1 and Table 3, the map for 1980-2009 was based on 3 temperature products (CRU, UDEL and CHELSA) and 3 precipitation products (UDEL, CHELSA, GPCC), while the map for 1987-2016 was based on 2 temperature products (CRU and UDEL) and 2 precipitation products (UDEL and GPCC), as CHELSA only covers 1979-2013 (Table 1). Evidenced by Fig. 5, the CHELSA precipitation have a large impact on the KGC map. It is also be seen in Fig. 14, where the abrupt changes are all happening between 1983-2012 and 1984-2013. So I suspect the difference for the two periods largely come from inconsistent inputs for the two periods, and is not a reflection of the true shift in climate zones. I strongly recommend the authors to discuss the impact of having CHELSA before 2013 and not having CHELSA afterwards on their time series of KGC map.

There are also some minor issues:

- A grammar mistake in L17: “The new maps offer higher classification accuracy”, higher than which products?

- L30 and L36: the authors repeated the definition of the Koppen classification in these two lines, but used "annual cycles" in L30 and "seasonal cycles" in L36. What are the difference?
- L103-L104: "Evaluation results indicated that incorporating only CRU, UDEL temperature datasets and UDEL, GPCC precipitation datasets led to higher accuracy in the classification results." Table 3 tells me the combinations of CRU, UDEL and CHELSA temperature and UDEL, GPCC and CHELSA precipitation lead to the highest accuracy. So I don't understand why this sentence here did not mention CHELSA.
- L120: Please give the ref.
- L123: The Köppen climate classification scheme was first introduced in 1884 (Rubel, F. & Kottek, M. Comments on: The thermal zones of the Earth by Wladimir Köppen (1884). (2011) doi:10.1127/0941-2948/2011/0258.)
- L125: KGC is not explained for the first time being used.
- 10. The accuracy of Beck et al. (2018) not plotted.
- L288: "Duplicate stations in the two datasets were further removed." This sentence should be moved to section 4.3?
- L306-307: If the products here are better than previous one, how the previous "worse" maps can be used for "evaluation"?
- L315-317: "Another improvement …, which show better agreement with global boreal forest distributions". I do not find the evidence from the figure.
- L318-L319: "Moreover, the new Köppen-Geiger maps show accurate depiction of important topographic features and correspond closely with tree lines in the forest cover maps over the regions with complex topography". I cannot see from Fig 11 why the new maps are better than Beck et al., (2018) and Kriticos et al., (2012).