Earth Syst. Sci. Data Discuss., author comment AC1
https://doi.org/10.5194/essd-2021-53-AC1, 2021

Reply on RC1

Diyang Cui et al.

Author comment on "A 1-km global dataset of historical (1979–2017) 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-2021-53-AC1, 2021

Comment 1: I wonder what the editorial policy is for plagiarism because I am concerned with the degree of copying and rewording in this paper. Below are some examples I found. I wouldn't be surprised if lots of other sentences were lifted from other papers.
Response: We apologize that in the manuscript we rephrased some sentences from Beck et al., 2018, and didn't properly cite them. The part accounts for 2% similarity based on the similarity report. The editor has reviewed the manuscript and agreed that the similarity level is within the acceptable range before the preprint. To make sure that all the work presented is original work, we will make corresponding changes as suggested.
Comment 2: "The highest confidence was given to the most common climate class for each grid cell." Maybe mention that this approach was adopted from Beck et al. (2018).
Response: Thank you for pointing this out. The approach of the confidence level from Beck et al. (2018) is one of the data integration methods that we have tested, which demonstrated the highest accuracy. We will provide the citation of Beck et al. (2018) for the confidence level approach in the manuscript.
Comment 3: "The Köppen-Geiger climate maps currently available are limited by relatively low spatial resolution, poor accuracy, and noncomparable time periods." The "low spatial resolution" argument is of course incorrect as the authors well know. Poor accuracy is also incorrect (the Beck et al., 2018, map has only slightly lower accuracy according to your evaluation). And what are noncomparable time periods? Noncomparable to what? Does it really matter that much whether the climatology represents 1988-2017 or 1980-2016 given the input uncertainty?
Response: Thank you for raising your concerns about the scientific importance of our work. We have summarized the currently available Köppen-Geiger climate map products and found out that most of the existing global Köppen-Geiger climate maps with long-term and continuous temporal coverage have a relatively low resolution of 0.1-0.5o ¬and low accuracy (Grieser et al. 2006; Belda et al. 2014; Kriticos et al. 2012; Rubel und Kottek 2010). Beck et al. (2018) has an unprecedented resolution of 1-km and relatively higher accuracy but is limited in use by its temporal coverage of a single historical period (1980-2016) and a single future period (2071-2000, RCP8.5). Based on this, we concluded that "The Köppen-Geiger climate maps currently available are limited by relatively low spatial resolution, poor accuracy, and noncomparable time periods." When referring to "non-comparable time periods", we mean single and not continuous time periods, in contrast with time-series data. We apologize that the phrase is not clear and may cause confusion. We will replace it for clarity and precision.

To address the question about whether the climatology represents 1988-2017 and 1980-2016 provide significant importance considering the input uncertainty, we summarized the findings from previous literature regarding the recent changes of Köppen climates. Based on the literature review, the recent accelerated global warming since the 1980s has led to large-scale shifts in Köppen climates over approximately 5.3–5.7% (7.9–8.5 million km2) of the total land area (Rohli et al. 2015; Belda et al. 2014; Chen und Chen 2013; Chan und Wu 2015; Yoo und Rohli 2016). Statistically significant changes have been observed since 1980 for arid and tundra climates. Many of these studies applied climatology input with a one-year interval. Detection of these interannual and interdecadal changes in climate zones require continuous long-term temporal coverage. The aim of the presented Köppen-Geiger climate map series is to fill the gap. We showed an example of applying the Köppen-Geiger climate map series to estimate the long-term annual trends of area changes for each climate type in 1979-2017 in the manuscript. The results reflect a general pattern of climate shifts into warmer and drier climates. To justify the point that we make, we will revise the manuscript and put more emphasis on the application of Köppen-Geiger map series on change detection.

We agree with the reviewer and have the same concern that the input uncertainty may influence the change detection results. To address the uncertainty issue, we provided the confidence level adopted from Beck et al. 2018 and classification accuracy to quantify the uncertainty. In addition, we tested the sensitivity of methods and data input to improve the accuracy to a higher level compared with all the other map products.

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