

Interactive comment on “Spatial-and temporal-patterns of global soil heterotrophic respiration in terrestrial ecosystems” by Xiaolu Tang et al.

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This interesting manuscript and dataset focus on global heterotrophic respiration (RH), using over 500 observations to produce a wall-to-wall global map over time. As the authors describe well, this is really important for understanding changes in the earth system, quantifying this poorly-constrained carbon flux, and benchmarking models. The ms is fairly well written and interesting; methods generally seem solid; references and discussion are well done.

There are some problems (see detailed list below). First, it's essential include the R code, and/or make it publicly available in a repository, for transparency and repro-

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ducibility reasons; see below.

Second, although the discussion notes (395-) that one weakness of this dataset is the annual temporal resolution, it seems fair to note that a second is the half-degree spatial resolution. For many applications this is a significant limitation.

Finally, although the ms is very readable, there are many linguistic oddities and editing by a fluent English speaker would be useful.

Overall, this is an excellent study documenting a dataset that will be valuable for many carbon cycle and earth science researchers. It needs moderate revisions in a number of areas.

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Specific comments

1. Lines 43-44: remove this sentence perhaps? Awkward
2. L. 55-57 is basically repeated in 76-77; I'd remove it here
3. L. 74: perhaps “these approaches are beginning to be used” – the history of this is short
4. L. 80-: but note Shao et al. (2013), <http://dx.doi.org/10.1088/1748-9326/8/3/034034>
5. L. 89-91: this sentence probably should be moved to end of previous paragraph?
6. What software was used for all analyses? What versions (e.g. what version of caret)? Where is the code available/deposited? These are all critical for transparency and reproducibility
7. L. 183: the methods are a bit unclear—how was this R2 calculated? From the cross-validation?
8. L. 191-: changes over...? Space? Time? Clarify

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9. L. 220: wow, that's a huge range
10. L. 276-: you should also address the 43.6 value calculated by Konings et al. (2019), <http://dx.doi.org/10.5194/bg-16-2269-2019>
11. L. 311-314: interesting idea!
12. L. 333-335: maybe note this is **really** uncertain though
13. L. 348: perhaps clarify to "indicating that in our model, climate change did not"
14. L. 356-357: yes! Perhaps put in abstract?
15. L. 382: Xu and Shang (2016), <http://dx.doi.org/10.1016/j.jplph.2016.08.007>, another really good reference here
16. L. 401-402: with respect, I think this (available on request) is not adequate; the R code should be deposited and open. See #6 above
17. Figure 1 could be improved: lat/lon references, marginal histograms
18. Figure 5: are the errors bars based on annual flux over many years? Clarify

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