

Thank you to reviewer #3 for your informative review. In response to your concerns about applying our results across the tropics, we have expanded our Discussion section to clarify our reasoning for creating a tropics-wide uncertainty map, and included additional information regarding the sites. Reviewer comments are in italics, responses are in blue. Line numbers are from the original manuscript.

This study evaluates the bias of MODIS VCF with field data and implements a correction for VCF. The manuscript is well written and presented with nice figures. But I am more interested in the method part you developed to do comparisons than the corrected VCF map and the findings of underestimated tree cover which are not surprising. As I get worried about the feasibility of using the limited number of samples to correct MODIS VCF maps covering the whole tropics, which will further make the related results pale. For the IGBP map, please specify year used and the spatial coverage of IGBP for grouping

IGBP was +/- 30Deg North and year 2006-2009, as per MODIS VCF and field plots. We will include these details in the methods.

My suggestion is to just focus your analysis at the site level or to limit your study area to where the TROPBIT data are representative.

This paper is targeted towards the use of the MODIS VCF product in global environmental models, which requires extrapolating the TROBIT-VCF mismatch across the tropics. The focus is to highlight potential problems introduced when VCF is used as a definitive tree cover target in studies using these global modelling approaches. We have made the limitations of using a limited number of field sites and justifications clearer in our Discussion. See response to reviewer 2, point 1 and 2 for more detail.

Small questions,

1, specify the meaning of the terms “tree cover distributions”

We have corrected the incidences of ‘tree cover distributions’ to ‘tree cover frequency distributions’, and provided the definition within the Methods section.

2, should consider moving the details about the TROBIT field data to methods section

We have moved the relevant details to Methods.

3, please specify the rationality of using the equation 1.

A logit transformation is a standard approach to transform double-bounded variables (in our case, fractional cover - bounded between 0 and 1) for regression. This prevents predictions based on regression from taking unphysical values (i.e covers less than zero or greater than 1) (Gelman et al. 2013; Bistinas et al., 2014; Kelley et al. 2019, 2021). While other transformations are also useful for regression of bounded data, logit maintains data ranking – important as, to our knowledge, there is no indication of systematic ranking issues in either VCF or TROBIT.

Also our Bayesian regression technique assigns the likelihood of a parameter set based on the conditional probability of a VCF value given our VCF reconstruction from TROBIT. As already stated in the methods, the best way to calculate this probability is to ensure a normally distributed regression model. On the right hand side of the equation, we transform

TROBIT cover using a logit-like function with two extra parameters to account for known asymmetry in cover distributions, which may affect the normality of error distribution. We have already detailed this in the methods (“This is similar to a standard linear regression of logit transformed data, accounting for maximum and minimum bounds of 0-100 % tree cover, allowing for a non-symmetric transformation of tree cover.” - line 160 -165 in the current iteration of the manuscript).

References:

Bistinas, I., Harrison, S. P., Prentice, I. C., and Pereira, J. M. C.: Causal relationships versus emergent patterns in the global controls of fire frequency, *Biogeosciences*, 11, 5087–5101, <https://doi.org/10.5194/bg-11-5087-2014>, 2014.

Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A. and Rubin, D. B.: *Bayesian Data Analysis*, Third Edition, CRC Press., 2013.

Kelley, D. I., Bistinas, I., Whitley, R., Burton, C., Marthews, T. R. and Dong, N.: How contemporary bioclimatic and human controls change global fire regimes, *Nature Climate Change*, 9(9), 690–696, doi:10.1038/s41558-019-0540-7, 2019.

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