Dear Authors,

I still have two comments for #5 and #6. Regarding #5, it is not uncertainty. It sounds like quality indicator. Regarding #6, my suggestion is to add a table of CI statistics from different products. It will be of great help to provide such table at the country level in SI. I will send it out for review now to speed the process. But please address these two comments together with comments from reviewers when you have them and if you receive a decision of revision.

#5. The uncertainty or quality of the data should be added in the product. As seen from this paper, the spatial variation of uncertainty is significant.

#6. A result table of comparison with other studies can be added. It is difficult to evaluate the difference of this product with other studies based on current presentation.

Response: We would like to thank for the constructive comments and suggestions from Topical Editor that help significantly improve the research and the quality of this work. Thanks for your kindness to send our manuscript out for review and open discussion which speed up the process duration even with two comments from you not properly addressed. We further revised the manuscript addressing the two comments, and below we provided our detailed responses to your concerns.

*1 Regarding #5, it is not uncertainty. It sounds like quality indicator.

Response: Thanks for your comments. We agree that the proportion of the invalid number of 16-day composite during 2016-2018 is a quality indicator rather an index of uncertainty. The more invalid 16-day composite TOA reflectance observations, the lower quality of the input data and the cropping intensity products are. We modified the quality map by ranking the number of invalid observations from 1 to 10. Regions with zero invalid observations are marked as highest quality at 10 while regions with more than 56 invalid observations are marked as worst quality at 1. Such a quality map is added in the supplementary document (Figure S3).

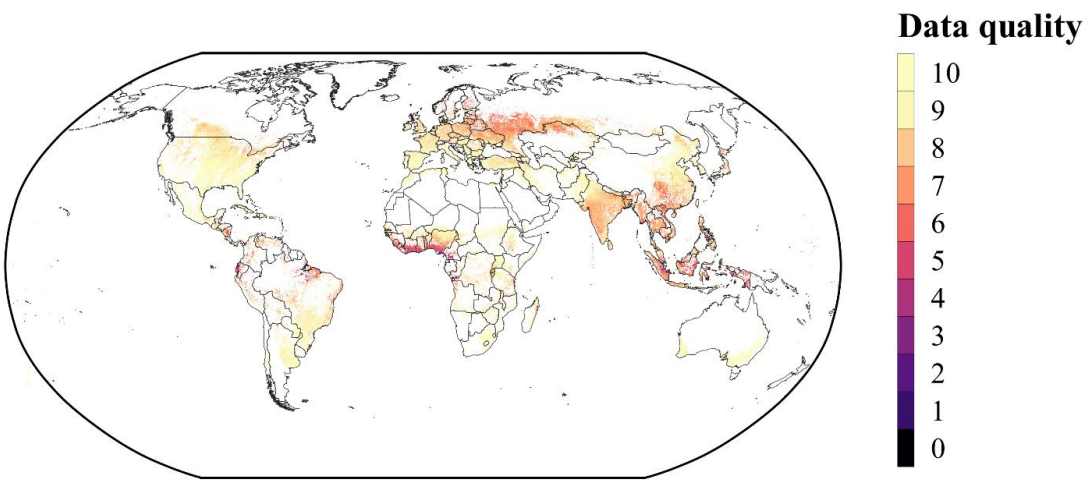

Figure S3. Data quality map of GCI30 measured as the invalid number of 16-day composite during 2016-2018. Zero indicates lowest data quality while 10 indicates highest data quality.

Moreover, as suggested, a systematic uncertainty analysis was applied referring to a published paper on Earth System Science Data (H. Liu et al., 2020) by interpolation the uncertainty from validation samples' locations to a spatial distribution map. Among the 3744 validation samples, uncertainties are marked as 1 when the absolute values of prediction bias of the cropping intensity are equal or larger than 2, while test sample locations with zero bias are marked as 0. The spatial distribution map of the uncertainty of GCI30 result is generated based on a Kriging interpolation method (Oliver and Webster, 1990) using ArcMap software. The search radius parameter of Kriging interpolation is set to 12 nearby sample units, the other parameters as default. The value of the uncertainty ranges from 0 to 1. A value close to 0 indicates a lower uncertainty, while a value near to 1 indicates a higher uncertainty and a higher possibility of overestimation or underestimation on cropping cycles. We also added the description of the uncertainty method in the methodology part in section 2.4. In the result and discussion part, a global uncertainty map of GCI30 product (Figure 5 in the revised manuscript) is added and the uncertainty of the GCI30 is further discussed in section 3.1 Reliability of GCI30.

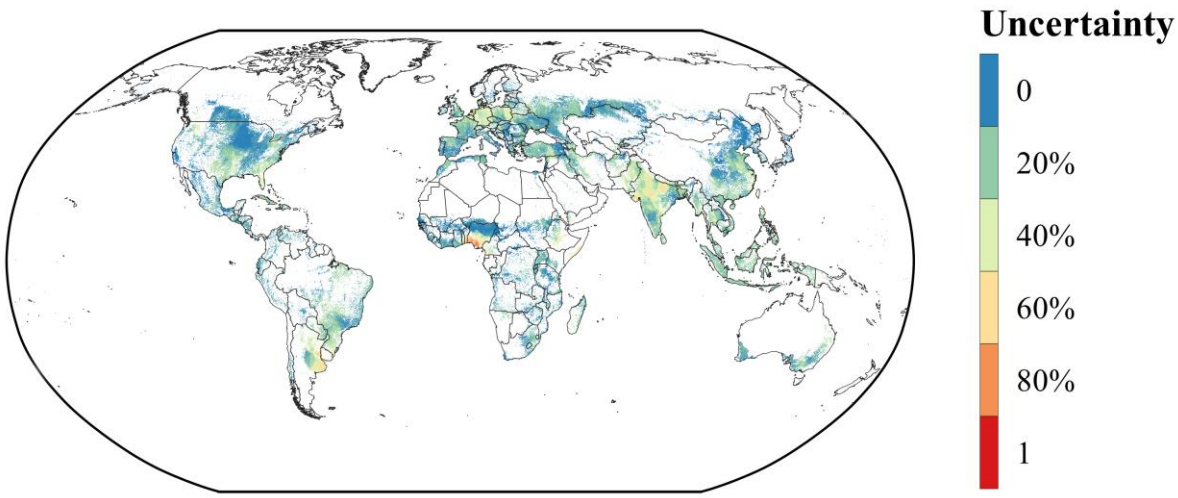

Figure 5: Global uncertainty map of GCI30 during 2016-2018, where regions in red represent higher uncertainty and those in blue represent lower uncertainty.

References:

Liu, H., Gong, P., Wang, J., Clinton, N., Bai, Y., and Liang, S.: Annual dynamics of global land cover and its long-term changes from 1982 to 2015, Earth Syst. Sci. Data, 12, 1217–1243, https://doi.org/10.5194/essd-12-1217-2020, 2020.

Oliver, M. A., & Webster, R. (1990). Kriging: a method of interpolation for geographical information systems. International Journal of Geographical Information System, 4(3), 313-332.

*2 Regarding #6, my suggestion is to add a table of CI statistics from different products. It will be of great help to provide such table at the country level in SI.

Response: Thanks for this valuable comment. A new figure (Figure 9 in the revised manuscript) is added to show the differences of annual CI statistics between GCI30 and four existing products at country level. We further described the spatial pattern of the variations between our products and existing ones at national scale in section 3.3. Cross comparison with other studies as follows: National statistical CI values derived from GCI30 are in general close to that of MCD12Q2, and VIP4. The differences over a large proportion of countries were within ±0.3 ranges between GCI30 and those two products, mostly in Asia and Southern Africa. GCI30 and SACRA also presents similar patterns of CI at national scale, especially in Asia. GCI30 presents higher CI values in Central Europe, Southeast Asia Islands, as well as Canada, Brazil and Mexico. In contrast, positive difference values of cropping intensity were commonly observed all over the world as presented by the GCI30 – R&F map. Lower CI values

are only observed in few countries in Africa, Asia and Southern America. In the supplementary document, as suggested, we also added a table (Table S4) at country level to compare the CI statistics from our GCI30 and other four different global CI product (the “NumCycles” layer of MCD12Q2, the “Number of Seasons” layer of VIP4, harvest frequency by Ray and Foley (2013) and SACRA product (Kotsuki and Tanaka, 2015)). Please note that the CI statistics is only available for GCI30 and four other global products because only those global products are available or accessible.