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Reply on RC1

George Z. Xian et al.

Author comment on "Implementation of the CCDC algorithm to produce the LCMAP Collection 1.0 annual land surface change product" by George Z. Xian et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-202-AC1>, 2021

L47-48: To our knowledge, this is the first set of published 30 m annual land cover and land cover change datasets that span from the 1980s to the present for the United States. This sentence should be revised because a recently paper was not referred in this manuscript. Prof. Gong's team produced the first 30 m global annual to seasonal land cover maps for 1985–2020, which covered the study area and temporal extent of LCMAP. *Reply: Agreed with the comment about the global land cover. The Global products produced by Lui et al. (2021) and Zhang et al. (2021) included seamless data cube and land cover for the globe. However, the LCMAP products contain annual land cover and associated spectral change information that has a wide implication for land change assessment. We changed the sentence and added and relevant manuscripts in the reference list. Thanks for the recommendation.*

L293: 3.4 Land cover classification. It is better to add a land-cover classification flowchart and the corresponding explanations here. *Reply: A flowchart has been created and added as Fig.3*

L329-333: How many bands and features were used in total? Why the 'intercept' parameter was discarded? What is the contribution of brightness temperature bands? *Reply: There was a total of 68 feature combinations for classification. We used model information generated from 7 spectral bands, including 8 model coefficients and one RMSE for each band. We also used five ancillary data: elevation, slope, aspect, position index, and potential wetland index. The classification was accomplished using information from CCD models. These models were processed to make the land cover classification because different land cover classes can have different shapes for the estimated time series models, in which the overall mean and model coefficients except intercepts can be used to estimate the intra-annual changes caused by phenology and sun angle differences for the *i*th Landsat Band. The classification was accomplished without using intercepts. Because each tile has a different classification model, the contribution of the brightness temperature band may vary depending on the land cover type, condition, time, and location.*

L366-368: QA/QC is extremely important for the validation dataset. How many

interpreters are assigned for each sample? More details should be given for the QA/QC processing, not just a reference (Pengra et al., 2020a).

Reply: The 25,000 reference sample pixels were each interpreted by a trained interpreter with approximately 60% of these pixels interpreted independently by a second analyst. Much of the QA/QC process relied on comparing the interpretations at these duplicated sample pixels. Duplicated sample pixels that had interpreter disagreement were used in QA/QC process such as: to identify issues with specific classes or interpreters, to flag sample pixels for further review and possible editing, and to provide ongoing training and feedback to interpreters throughout the collection process. QA/QC related reviews were also completed on sample pixels that showed interpretation data such as uncommon and/or illogical land use and land cover combinations, multi-year disturbance processes, rare classes, or other opportunistically identified situations. Sample pixel interpreted attributes were edited if necessary to create the final attribute assignments for the reference data. These final attributes were then cross-walked to a single LCMAP land cover class label. We added several sentences to explain QA/QC process. The number of interpreters total ranged between 5 and 11 depending on the specific point in time of the collection effort. QA/QC reviews and edits involved between 2 and 4 interpreters depending on the type of review and point in time in the collection effort (based on interpreter availability and other factors).

L524-526: Indeed, the mapping error of NLCD could potentially be carried over to the training samples. How does it affect the classification accuracy of the LCMAP dataset? Two references can benefit this concern (Fig.1 in Gong et al., 2019; Fig. 10 in Zhang et al., 2021).

Reply: When the method was implemented to produce LCMAP products, we selected NLCD as the training data source. The reference dataset was developed independently and was not completed when LCMAP products were produced. To ensure the classification can capture land cover features correctly, a certain number of training samples were selected in each of 3x3 tiles. The large number of selected samples that were widely distributed in the target tile represent land cover conditions of each land cover type. We did not use reference data to check these training samples due to objective concern for reference data. However, we appreciate the reviewer's suggestion for these two references. We also added several paragraphs in the discussion section to discuss training data selection and cited the two publications.

"To select a sufficient size of training samples is important for CCDC models to obtain accurate classification. Previous land cover post-classification analysis suggested that the overall classification accuracy increased when the training samples increased (Gong et al., 2020). The recent global land cover classification also suggested that the appropriate training sample size for a mapping extent of three 158 km x 158 km tiles should be larger than 60,000 (Zhang et al., 2021). For the LCMAP land cover classification, a much large size training was utilized to ensure that these training could represent landscape features in the classification tiles."

L488-489 The LCMAP product suite includes five land cover change and five land surface change science products. There is no link to the corresponding parts in the Supplementary Material. Please check throughout to link the supplementary file with the main manuscript.

Reply: The Supplementary Material was attached to the manuscript when it was submitted to the journal. We have checked with the topic editor and was told that the attachment was appropriate. We had words to explain the supplementary material is attached.