

Report of Review

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The manuscript presents an interesting approach to mapping crop residue cover across selected Mollisol regions. The proposed CrRUC-M framework is generally well designed, with a clear workflow and a reasonable data-mining approach. Overall, the study is methodologically solid and has the potential to make a useful contribution to crop residue mapping. However, several aspects related to study-area definition, compositing strategy, threshold selection, and validation design require further clarification to improve the methodological transparency, robustness, and reproducibility of the study.

1. The delineation of the study areas also appears to differ between China and the United States. The Chinese study areas are defined using provincial and municipal administrative boundaries (Lines 116–117), whereas the U.S. study areas are delineated using a hybrid approach integrating administrative boundaries with multiple datasets (Fig. S1). Please clarify whether a consistent set of criteria was applied to define study areas across countries. If different approaches were necessary, the manuscript should explain the reasons and discuss whether these differences could influence the validation results. In particular, differences in study-area delineation could alter the proportions of residue/non-residue or positive/negative samples and consequently affect omission error, commission error, and other performance metrics reported in Section 4.2.
2. Related to the previous comment, the criteria used to include geographical areas in the U.S. study domain through the hybrid approach shown in Fig. S1 are unclear. Please specify the inclusion/exclusion criteria and describe how the datasets shown in Fig. S1a and Fig. S1b were integrated. If thresholds, Boolean operations, weighted overlays, or other map-algebra procedures were used, these should be explicitly reported so that the study-area delineation can be reproduced.
3. In Section 3.1.2, Max-SWIR1 is identified as the optimal compositing strategy. However, it is unclear how this conclusion was derived from Fig. 5. Please clarify whether the strategies were evaluated using quantitative criteria or primarily through visual inspection. If quantitative metrics were used, they should be reported and the criterion for selecting Max-SWIR1 should be explicitly defined. If the selection was based on visual interpretation, the manuscript should describe the interpretation criteria and acknowledge the potential subjectivity of this assessment.
4. Figure 6 appears to provide important evidence for the methodological development, but the source of the spectral histograms is unclear. Please specify whether these distributions were derived from samples classified within the present study or obtained from an

external dataset or previous study. If they were generated in this study, the manuscript should explain how the land-cover/residue classes and samples used to construct the distributions were identified.

5. Line 300 relies on an index described in Cui et al., whose manuscript is currently under review. Because the cited manuscript is not yet finally published, the present paper should provide sufficient information to independently understand and reproduce the index.
6. Lines 313–315 state that the close agreement among Otsu, K-means, and GMM indicates that threshold identification is relatively insensitive to the choice of unsupervised algorithm and that K-means and GMM were therefore used to quantify method-related uncertainty rather than being averaged to define the primary threshold. However, agreement among the methods demonstrates robustness to algorithm choice but does not, by itself, justify selecting Otsu as the primary method. This issue is particularly relevant given the small pairwise difference between Otsu and K-means in Fig.S8 (b). The manuscript should provide an independent methodological or theoretical rationale for prioritizing Otsu. Once Otsu is justified as the primary method, K-means and GMM can more clearly be interpreted as sensitivity analyses used to characterize method-related uncertainty.
7. Section 3.3.1 requires additional information about the ground-validation survey design. Please report the size or spatial extent of the validation blocks, the criteria or sampling strategy used to select the blocks, the total number of ground-survey samples, and the number of samples collected within each block.
8. In Section 3.3.2, please report how many ground-survey samples initially received inconsistent labels from the two interpretation teams, as well as the proportion of the total validation dataset that these samples represent. The inter-team disagreement rate would provide useful information about the reliability and reproducibility of the visual interpretation procedure.
9. Ukraine and Argentina are absent from the product intercomparison in Section 4.3. Although the study area covers four subregions, both the ground validation and product intercomparison appear to be limited to only two of them. Consequently, the reliability and transferability of the mapping results for Ukraine and Argentina cannot be adequately assessed. If suitable reference products are available, I suggest including these two regions in the product intercomparison. If this is not feasible due to data limitations, the manuscript should clearly acknowledge this limitation and discuss the uncertainty associated with applying the proposed method to regions without independent validation or intercomparison.

10. The Discussion would benefit from a clearer comparison between the proposed approach and previous remote-sensing methods for crop-residue mapping, including the studies represented by DOI 10.1016/j.rse.2006.05.018 and DOI 10.1016/j.rse.2011.09.016. In particular, the authors should discuss what methodological or practical advantages the proposed approach provides over previous methods, as well as its remaining limitations. Such a comparison would help readers better understand the methodological contribution and significance of the present study.

The study is generally well organized and methodologically sound. If the questions and concerns raised above are adequately addressed, I believe the manuscript would be suitable for publication.