Response to Topic Editor

I would like to thank the reviewers for their insightful comments and constructive suggestions, and the authors for their great efforts in addressing them. Since the first round of review, the manuscript has improved substantially, particularly in terms of overall structure, clarification of technical details, and the handling of data-related issues such as imbalance and quality. The workflow for data curation, quality control, and evaluation is now presented in a clearer and more coherent manner. Overall, the paper is in good shape. I encourage the authors to carefully consider and address the reviewers' second-round comments, as doing so will further strengthen the manuscript.

Response:

We sincerely thank the Topic Editor for the positive evaluation and constructive feedback. We are glad that the improvements in manuscript structure, clarification of technical details, and handling of data-related issues such as imbalance and quality have been recognized. We also appreciate the acknowledgment of the clearer presentation of our workflow for data curation, quality control, and evaluation.

We will carefully consider and address the reviewers' second-round comments in detail, and we are confident that these revisions will further enhance the clarity, rigor, and overall quality of the manuscript. We thank the Editor and reviewers again for their valuable guidance.

Response to the Review File Validation Remarks

Notification to the authors: 1. A "Short summary" system section contains scientific abbreviations. Please provide a written-out version to make it better understandable for non-experts. Please remember that there is a character-limitation for the short summary text of max. 500 characters (including spaces). 2. Each DOI link no matter where in the manuscript, must be accompanied by an "in-text" citation: https://www.earth-system-science-data.net/submission.html#getready > 5. Please add the citations to DOI links in the Abstract with the next file upload request. 3. The use of coloured or marked text in the .pdf manuscript file is not permitted. Text highlighting is only allowed in the author's tracked changes file to indicate changes. For the next revision, please send a clean .pdf manuscript file containing black text only.

Response:

We sincerely thank the editorial office for the detailed remarks. We have carefully addressed each point as follows:

(1) Short Summary Abbreviations: We have revised the short summary to provide written-out versions of scientific abbreviations, making it more understandable for non-experts. The revised short summary is within the 500-character limit.

(2) DOI In-Text Citations: All DOI links in the manuscript, including those in the Abstract, are now accompanied by proper in-text citations, following the ESSD submission guidelines.

(3) PDF Formatting: We have prepared a clean PDF manuscript file with black text only. All coloured or marked text has been removed; tracked changes are retained in the separate revision file to indicate modifications.

We appreciate the guidance and believe these revisions ensure full compliance with the journal's submission requirements.

Response to Reviewer

We greatly appreciate the reviewer's insightful and constructive comments, which have significantly helped to improve the quality and clarity of this manuscript. The manuscript has been carefully revised accordingly. The reviewer's comments are shown in **black**, and our responses are provided in **blue**.

Anonymous referee #1：

The authors have improved the manuscript a lot. And I still have the following comments:

1. I still didn't understand very well the so-called "4L-4D-15A" evaluation framework. Here, "4L" meant four layers. From Table 7, it seemed more like four dimensions. Might "4D" be better used here? Furthermore, why did the authors have to intensify the "4L-4D-15A" framework? Four dimensions include data, information, system, and application, which are different perspectives from the four domains and fifteen attributes.

Response:

Thank you for this helpful comment. We agree that the original description of the "4L-4D-15A" framework was not sufficiently clear and could lead to confusion between layers, dimensions, and domains.

In the revised manuscript, we clarified that the framework is **hierarchical rather than parallel dimensions**. Specifically, the protocol consists of four evaluation layers (Data, Information, System, and Application). Within each layer, an operational evaluation domain is defined, and these domains are described using fifteen specific attributes. The manuscript text has been revised to explicitly explain this structure and avoid referring to the layers as "dimensions".

We also revised the description around Table 7 to better explain the relationship among layers, domains, and attributes, making the framework clearer for readers.

2. The FSC threshold for flagging a pixel to snow is 0.15, which is suggested to cite the following references: Painter et al. (2009); Rittger et al.(2013), Hao et al.(2019). I checked the paper of Zhang et al.(2019), which didn't mention it.

• T. Painter, K. Rittger, C. McKenzie, P. Slaughter, R. E. Davis, and J. Dozier, "Retrieval of subpixel snow covered area, grain size, and albedo from MODIS," Remote Sensing of Environment, vol. 113, no. 4, pp. 868-879, 2009.

• K. Rittger, T. H. Painter, and J. Dozier, "Assessment of methods for mapping snow cover from MODIS," Advances in Water Resources, vol. 51, pp. 367-380, 2013.

• Hao, S., Jiang, L., Shi, J., Wang, G., and Liu, X.: Assessment of MODIS-Based Fractional Snow Cover Products Over the Tibetan Plateau, IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens., 12, 533–548

Response:

Thank you for pointing this out. We acknowledge that the citation in the previous manuscript was not very appropriate. Zhang et al. (2019) discussed the NDSI threshold (0.1) used for snow detection rather than the FSC threshold itself. In our study, the FSC threshold of 0.15 was derived following the standard MODIS snow-mapping approach, where NDSI-based snow detection is translated into FSC estimates.

Following the reviewer's suggestion, we have revised the manuscript to directly cite the studies that support this threshold, including Painter et al. (2009), Rittger et al. (2013), and Hao et al. (2019). The relevant text and references have been corrected accordingly. This revision improves the clarity and accuracy of the methodological description.

We appreciate the reviewer's careful comment.

3． Although the SDC500 is a seamless MODIS daily surface reflectance data dataset, it would cause errors over the cloud existence, such as in the Qinghai-Xizang Plateau region, where clouds could exist for a long time and over a large area. I'd like to suggest that the authors state it clearly in the manuscript. The use of this seamless MODIS data product remains subject to uncertainty in the regions with persistent cloud cover.

Response:

Thank you for this helpful comment. We agree that although SDC500 provides a seamless MODIS daily reflectance dataset, uncertainties may remain in regions with persistent cloud cover. This is because SDC500 partly relies on gap filling and temporal smoothing to generate continuous observations, and prolonged cloud contamination may introduce additional uncertainty in the reconstructed reflectance.

Following the reviewer's suggestion, we have clarified this point in Section 5.3 of the revised manuscript by explicitly mentioning the potential uncertainty associated with SDC500 in regions with long-duration cloud cover.

We appreciate the reviewer's suggestion, which helped improve the transparency of the uncertainty discussion.