Response to Reviewer Comments

General comments

This study presents the CCAV-10m dataset, the first annual, species-level coastal wetland vegetation map of China at a 10-meter resolution, spanning from 2016 to 2023. By developing a novel phenology-guided classification network (P_SVCN) that integrates Sentinel-1 SAR data with Sentinel-2 optical imagery, the authors have generated a highly consistent dataset that captures the spatiotemporal dynamics of six key coastal wetland vegetation types. The manuscript is well-written and presents a technically sound methodology, effectively filling a critical data gap in coastal ecosystem monitoring.

***Response**: We sincerely thank you for your insightful comments on our manuscript. Your feedback has been extremely valuable and instrumental in guiding us to make improvements. After careful consideration, we have implemented nearly all of your suggestions to enhance the quality of the manuscript. We trust that these revisions will meet your expectations. Detailed responses to your comments are outlined below.*

Specific comments and suggestions

Point 1: Please ensure that all botanical taxonomic names follow standard nomenclature throughout the manuscript. Genus names should be capitalized, specific epithets should be lowercase, and the entire binomial must be italicized (e.g., *Spartina alterniflora*). After the first mention of the full name, the genus may be abbreviated (e.g., *S. alterniflora*)

***Response 1**: We appreciate the reviewer's attention to detail. The botanical names have been corrected throughout the manuscript according to the standard nomenclature (Genus species). Specifically, we ensured proper capitalization, italics, and the use of abbreviations after the first full mention. See our revision in Lines 7-9 on pages 1.*

> ***Lines 147-163**: Spatiotemporal analysis of CCAV-10m reveals that Suaeda spp. is the dominant vegetation type, followed by Spartina alterniflora, whose coverage nearly equals the combined extent of Phragmites australis, mangroves, Scirpus mariqueter, and Tamarix chinensis.*

Point 2: While Figure 7 provides a clear visual trend of provincial stacked areas, it is difficult for readers to extract precise annual values for specific provinces and species . To enhance the data's utility and citability for future research, I recommend including a detailed statistical table in the Appendix/Supplementary Materials containing these specific values.

***Response 2**: We value your constructive suggestion regarding the data accessibility of Figure 7. We fully agree that providing the exact numerical values will significantly enhance the utility and citability of our research. As recommended, we have added a comprehensive statistical table in the Appendix (Table A1). To make the data as accessible as possible, we have organized the table by province and species, with annual area values (10^4 ha) tabulated across the entire study period (2016–2023). This layout allows for both easy extraction of specific values and direct cross-referencing with the trends visualized in Figure 7. We have also added a sentence in the revised manuscript (Line317-318, Page19) to direct readers to this appendix information.*

Your feedback has been very helpful for improving our research. We have addressed this issue in detail in the Appendix A section of the manuscript. See our revision in Lines 317-318 on pages 19 and Lines 379-382 on pages 22.

***Lines 317-318**:*

Detailed annual values for each province and species are provided in the Supplementary Materials (Table A1).

***Lines 379-382**:*

Appendix A: Statistical data for provincial coastal vegetation areas

To complement Figure 7, this appendix provides the precise numerical datasets for provincial coastal vegetation coverage. The following table organizes the annual areas (10^4 ha) by province and species, covering the entire study duration from 2016 to 2023.

Table A1. Annual area values (10^4 ha) of coastal vegetation by province and species (2016–2023).

Province	***Species***	***2016***	***2017***	***2018***	***2019***	***2020***	***2021***	***2022***	***2023***
Fujian	*S. alterniflora*	*2.84*	*3.16*	*2.76*	*2.57*	*2.81*	*2.31*	*2.53*	*2.29*
	P. australis	*2.56*	*3.26*	*3.21*	*2.81*	*3.39*	*3.80*	*3.14*	*3.85*
	Mangroves	*2.00*	*1.97*	*2.16*	*2.74*	*3.27*	*2.88*	*2.96*	*3.12*
Hebei	*S. alterniflora*	*1.34*	*0.86*	*1.00*	*0.85*	*1.61*	*1.32*	*2.42*	*1.57*
	Suaeda spp.	*0.71*	*0.89*	*0.61*	*0.95*	*1.38*	*1.48*	*1.47*	*1.46*
	P. australis	*2.87*	*2.48*	*1.70*	*2.60*	*3.81*	*4.45*	*3.73*	*3.28*
	T. chinensis	*0.30*	*0.34*	*0.21*	*0.37*	*0.73*	*0.72*	*0.78*	*0.57*
Jiangsu	*S. alterniflora*	*3.74*	*5.06*	*4.06*	*4.17*	*4.23*	*4.41*	*4.86*	*4.71*
	Suaeda spp.	*4.67*	*5.30*	*4.48*	*5.65*	*5.17*	*4.97*	*4.92*	*5.28*
	P. australis	*3.61*	*2.71*	*2.71*	*4.68*	*3.73*	*4.71*	*4.59*	*5.46*
Liaoning	*S. alterniflora*	*4.25*	*3.25*	*2.86*	*1.38*	*2.16*	*2.13*	*1.77*	*3.63*
	Suaeda spp.	*2.91*	*2.45*	*2.51*	*6.09*	*6.02*	*5.32*	*5.10*	*0.00*
	P. australis	*9.03*	*4.11*	*4.18*	*1.17*	*0.53*	*1.90*	*0.45*	*6.59*
Shandong	*S. alterniflora*	*2.63*	*6.10*	*4.10*	*2.44*	*4.10*	*3.29*	*3.36*	*2.99*

	Suaeda spp.	*1.87*	*2.67*	*2.16*	*3.19*	*9.55*	*2.90*	*2.90*	*3.11*
	P. australis	*3.91*	*7.26*	*5.31*	*7.09*	*8.46*	*8.49*	*7.45*	*7.12*
	T. chinensis	*0.64*	*1.44*	*0.66*	*0.75*	*2.08*	*1.28*	*2.26*	*1.08*
Zhejiang	*S. alterniflora*	*5.50*	*4.81*	*4.90*	*4.64*	*5.32*	*4.05*	*4.71*	*3.96*
	P. australis	*3.89*	*3.76*	*3.98*	*4.27*	*4.59*	*4.64*	*4.46*	*5.24*
	S. mariqueter	*3.18*	*3.30*	*2.52*	*2.62*	*2.44*	*2.72*	*1.93*	*2.11*
	Mangroves	*3.13*	*2.78*	*2.99*	*3.24*	*4.13*	*3.87*	*3.35*	*4.21*
Tianjin	*S. alterniflora*	*0.93*	*0.81*	*1.00*	*0.46*	*0.40*	*0.62*	*0.71*	*0.78*
	Suaeda spp.	*0.35*	*0.38*	*0.32*	*0.34*	*0.47*	*0.55*	*0.64*	*0.66*
	P. australis	*1.64*	*1.43*	*1.40*	*0.93*	*1.24*	*1.91*	*1.77*	*1.61*
	T. chinensis	*0.21*	*0.25*	*0.27*	*0.17*	*0.20*	*0.47*	*0.36*	*0.41*
Shanghai	*S. alterniflora*	*1.30*	*1.15*	*1.39*	*2.30*	*1.39*	*1.44*	*1.59*	*1.72*
	P. australis	*1.04*	*1.31*	*1.09*	*1.71*	*1.29*	*1.27*	*0.99*	*0.97*
	S. mariqueter	*0.62*	*0.62*	*0.44*	*0.75*	*0.25*	*0.14*	*0.26*	*0.14*

Point 3: The manuscript states that Sentinel-2 imagery was selected as bi-temporal data based on phenological information. However, the selection criteria or compositing strategy for Sentinel-1 imagery remains unclear. Please supplement the Methodology section with a description of how the Sentinel-1 data were selected.

***Response 3**: We greatly appreciate your comment regarding the Sentinel-1 data processing. Unlike the Sentinel-2 imagery, which was selected based on bi-temporal phenological windows to capture spectral contrasts, Sentinel-1 (SAR) imagery was processed using all available scenes throughout the entire year. We calculated the annual mean backscatter coefficients for both VV and VH polarizations. This multi-temporal averaging strategy was adopted to effectively suppress inherent speckle noise and capture the stable structural characteristics of different coastal vegetation types over the full annual cycle. We have added a detailed description of this compositing strategy to the Data and methods section. Please refer to our revisions in Lines 136-141 on pages 6.*

> ***Lines 136-141**: To suppress the inherent speckle noise in SAR imagery and capture stable annual structural signatures of coastal vegetation, we utilized all available Sentinel-1 scenes acquired throughout the entire study year. An annual mean compositing strategy was applied to generate a representative backscatter coefficient for each pixel. Based on these considerations, this study utilized the processed VV and VH single-polarization SAR data along with three derived indices, including SAR_NDVI, SAR_SUM, and SAR_Diff, for the classification of wetland vegetation types along China's coastal zones.*

Point 4: High-quality vegetation samples are critical for model training. In Section 3.3, it is mentioned that "samples underwent systematic quality control," but the specific procedures are not detailed. Please provide a clear explanation of the quality control criteria and methods used to ensure the reliability and representativeness of the training data.

***Response 4**: We would like to express our sincere gratitude for your insightful suggestion regarding* *the quality control of our samples, which has significantly enhanced the methodological rigor of our study. In response to your comments, you will find that we have added a comprehensive section, Appendix B, which provides a transparent and rigorous description of our two-stage QC process. See our revision in Lines 383-403 on pages 22.*

***Lines 383-403**:*

Appendix B: Quality Control Procedures for Vegetation Samples

B1. Validation of Interpretation Reliability via Field-Truth Benchmarking

To ensure the high quality and representativeness of the training data, we implemented a rigorous validation process for our visual interpretation criteria. All interpretation was performed using high-resolution Google Earth imagery, which provides the sub-meter level detail necessary to distinguish coastal wetland vegetation.

To quantify the reliability of our interpretation criteria, we conducted a consistency verification specifically at the locations of the field-surveyed sites. In this process, interpreters were required to perform a blind identification of the vegetation types by examining the high-resolution Google Earth imagery corresponding to each field-surveyed coordinate. By cross-referencing these image-based interpretation results with the actual ground-truth observations, we calculated the Kappa coefficient (k) using Equation 10.

Our verification yielded a Kappa value of 0.95, confirming that the classification features observed on Google Earth imagery highly match the actual vegetation types on the ground.

B2 Inter-Interpreter Cross-Validation

To further mitigate subjective bias, a double-blind review process was implemented. Each sample point was independently reviewed by at least two experienced researchers. Only samples where both researchers reached a 100% consensus were retained in the final dataset. This rigorous cross-verification ensured the internal consistency and reliability of the sample pool.

Following the quality control and cross-verification processes, the field-surveyed data and the validated interpreted samples were integrated into a unified high-confidence dataset. To further refine the sample pool, we excluded points located in mixed pixels or transition zones to prevent spectral contamination. Finally, this refined dataset was randomly partitioned into a training set (70%) and a validation set (30%). This partitioning strategy ensures that the model is trained on reliable data while maintaining an independent set for unbiased accuracy assessment.

Point 5: The public availability of the CCAV-10m dataset via a DOI is highly commendable, yet the long-term maintenance of the data remains a point of interest. Since the title emphasizes "Annual Spatiotemporal" monitoring while the series currently ends in 2023, could the authors clarify whether there are concrete plans to extend the dataset to include 2024, 2025, and subsequent years?

***Response 5**: We sincerely appreciate your commendable suggestion regarding the long-term maintenance of the CCAV-10m dataset, as we fully agree that that ensuring the long-term continuity of the CCAV-10m dataset is essential for spatiotemporal monitoring. In the revised Data Availability section, we have specified our plan to extend the dataset to include 2024, 2025, and subsequent years through annual updates. To maintain data traceability, we will adopt a version-controlled* *approach on the Science Data Bank platform, releasing different year intervals as distinct versions. Each update will be accompanied by updated technical documentation to clarify any refinements in the data or methodology. These additions ensure that the dataset remains a reliable and evolving resource for the community. See our revision in Lines 370-378 on pages 21-22.*

***Lines 370-378**:*

Data availability. The Sentinel-1 synthetic aperture radar (SAR) and Sentinel-2 multispectral data used in this study are available from the Copernicus Open Access Hub (https://scihub.copernicus.eu, last access: 21 October 2025) under the Copernicus open data policy. The species-level coastal wetland vegetation dataset, CCAV-10m, produced in this study is publicly available at the Science Data Bank (https://doi.org/10.57760/sciencedb.31077, Li et al., 2025). To ensure long-term spatiotemporal monitoring, we are committed to updating this dataset annually; these updates will be released as distinct versions corresponding to different year intervals (e.g., 2024, 2025, and beyond) and will be accompanied by updated technical documentation on the same platform. Validation samples comprising 84% of the total dataset are provided in the file 'Vegetation samples.xlsx' within the same repository; these samples cover all vegetation classes and major coastal regions and were derived from field surveys, visual interpretation, and public reference sources. The remaining 16% of the field sampling data are not publicly released but can be obtained upon a reasonable scientific request to the authors.