Response to the reviewers (egusphere-2026-1947)

Dear Editor and Reviewer,

We sincerely appreciate the time and efforts that the Editor and the reviewer have devoted to evaluating our manuscript and providing constructive comments. Our point-by-point responses are given as follows. The reviewer's comments are shown in black, and **our responses are purple**. Please note that all line numbers mentioned in our responses refer to the clean version of the revised manuscript.

Reviewer #1 (Comments to Author):

Reviewer #1 General Comments: This manuscript investigates the present and future responses of near-surface wind speed (NSWS) to different land-use and land-cover change (LULCC) types over China using experiments from the Land-Use Model Intercomparison Project (LUMIP) of Coupled Model Intercomparison Project Phase 6 (CMIP6). The topic is timely and relevant, as LULCC has long been considered an important but not sufficiently resolved driver of terrestrial wind speed changes. A major strength of this study is that it goes beyond treating LULCC as an aggregated factor and attempts to distinguish the roles of individual land-use states, transitions, and management practices. This provides a more detailed and physically informative view of how different LULCC pathways may influence NSWS. I appreciate the effort to evaluate model performance before conducting the attribution analysis. The results are interesting and the manuscript is well written. Overall, I find the manuscript suitable for publication after some revisions. My comments below:

[Response] We appreciate your encouraging feedback and positive evaluation of our manuscript. We have revised our manuscript thoroughly following your suggestions and comments.

Reviewer #1 Major Comment 1: It would be helpful to briefly clarify how the penalty parameter is selected and whether any cross-validation or sensitivity test was conducted. This would make the calibration procedure easier to reproduce.

[Response] Cross-validation was conducted to determine the penalty parameter. Specifically, we used leave-one-out cross-validation (LOOCV) to select it in a data-driven manner rather than prescribing it a priori. Following your suggestion, a detailed description of this procedure has been added to Sect. 2.5: "The ridge penalty parameter (α) was selected using leave-one-out cross-validation (LOOCV) from 100 logarithmically spaced candidate values between 10^{-6} and 10^{6}. For each candidate α, one sample was withheld in turn, and the model was fitted using the remaining $n-1$ samples and evaluated by predicting the withheld sample. The α yielding the lowest mean squared prediction error across all held-out samples was selected. The model was then refitted using all available samples with the selected α to obtain the final regression coefficients." Please refer to ***Lines 136–140*** in the revised manuscript for details.

Reviewer #1 Major Comment 2: The manuscript suggests that fertilization may influence NSWS through vegetation growth, surface albedo, evapotranspiration,

boundary-layer stability, and local circulation. This interpretation is reasonable, but the direction of the net effect is not straightforward. A short discussion clarifying why fertilization is associated with increased NSWS over much of China in the results would make this part more convincing.

[Response] Good suggestion. We have extended the discussion on the fertilization mechanism in Sect. 4 to explain why the net effect is positive in the simulations: "Fertilization can affect near-surface winds through competing processes. Enhanced vegetation growth increases aerodynamic roughness and surface drag, which would tend to reduce NSWS. At the same time, fertilization-induced changes in vegetation state, evapotranspiration and surface energy partitioning can modify boundary-layer stability, turbulent mixing and local thermal circulations. The predominantly positive NSWS response over much of China therefore suggests that, in the simulations, these thermodynamic and dynamical adjustments offset, and in many regions exceed, the direct wind-reducing effect of increased surface drag. The NSWS response to fertilization should thus be interpreted as the net outcome of these competing land–atmosphere processes rather than as a direct roughness effect." Please refer to ***Lines 374–380*** in the revised manuscript for details.

Reviewer #1 Major Comment 3: The distinction between SSP126-SSP370Lu and SSP370-SSP126Lu is important for the conclusions, but the current wording may be difficult for readers who are not familiar with LUMIP. I suggest adding one or two clearer sentences explaining what is fixed and what is changed in each comparison.

[Response] Point taken. We have clarified this in Sect. 2.4, which now states explicitly what is fixed and what is changed in each experiment, which pair is compared, and how each comparison can be interpreted: "For future, we analyze the LUMIP experiments ssp126-ssp370Lu and ssp370-ssp126Lu, which replace each scenario's LULCC forcing with that from the other scenario. The former retains all forcings other than land use from SSP1-2.6 while applying the SSP3-7.0 land-use forcing (LUH2 states, transitions, management, and harvest), whereas the latter retains the SSP3-7.0 background while applying the SSP1-2.6 land-use forcing. Comparing each swap experiment with its parent scenario provides an estimate of the LULCC contribution to NSWS under low- and high-emissions backgrounds, thereby probing interactions between emissions and land use. From a policy perspective, ssp126-ssp370Lu can be broadly interpreted as a low-emission pathway with less stringent land-use management, whereas ssp370-ssp126Lu represents a high-emission pathway with more sustainable land-use management. More specifically, the difference between ssp126-ssp370Lu and ssp126 quantifies the NSWS response to the contrast between these land-use management pathways under a low-emissions background, whereas the difference between ssp370 and ssp370-ssp126Lu quantifies the same contrast under a high-emissions background. Comparing these responses allows a direct assessment of how the effect of LULCC on NSWS depends on the emissions background." Please refer to ***Lines 114–125*** in the revised manuscript for details. In addition, the land-use trajectories of the two parent

scenarios are now described in Sect. 2.1 (***Lines 68–72***), and the "Description" column of Table 1 states which land-use dataset is used in each experiment.

Reviewer #1 Minor Comment 1: "with urbanization contributes the least" suggested be revised to "with urbanization contributing the least". Similar language issues appear in several places and can be addressed through careful editing.

[Response] We have revised the sentence to "while urbanization makes the smallest contribution among the examined LULCC types" (***Line 12***), and we have double-checked the whole manuscript to avoid similar wording issues.

Reviewer #1 Minor Comment 2: In Table 1, the caption "Used experiment of CMIP6" could be revised to "CMIP6 and LUMIP experiments used in this study".

[Response] Revised to "List of experiments from CMIP6 used in this study" (***Line 78***), which also follows the suggestion of Reviewer #2. The caption of Table 2 has been revised to "Global climate models selected from CMIP6" (***Line 80***).

Reviewer #1 Minor Comment 3: Several abbreviations are used without being defined at their first occurrence. Please provide the full names when these abbreviations first appear in the manuscript.

[Response] Thanks for pointing this out. We have checked all abbreviations, and LUMIP, CMIP6, SSP, LUH2, RMSE, MME, GHG, CC and SDR are now defined at their first occurrence.

Reviewer #1 Minor Comment 4: Some inconsistencies in capitalization are present in the tables and headings. Please revise them for consistency.

[Response] Corrected. The headings now use sentence case consistently (e.g., "2 Materials and methods", "3.1 LULCC-induced NSWS changes"), and the capitalization in Tables 1–4, in "skill score", "LULCC-induced" and in the caption of Fig. 4 has been unified.