

## **Response to the Comments from Reviewer #1:**

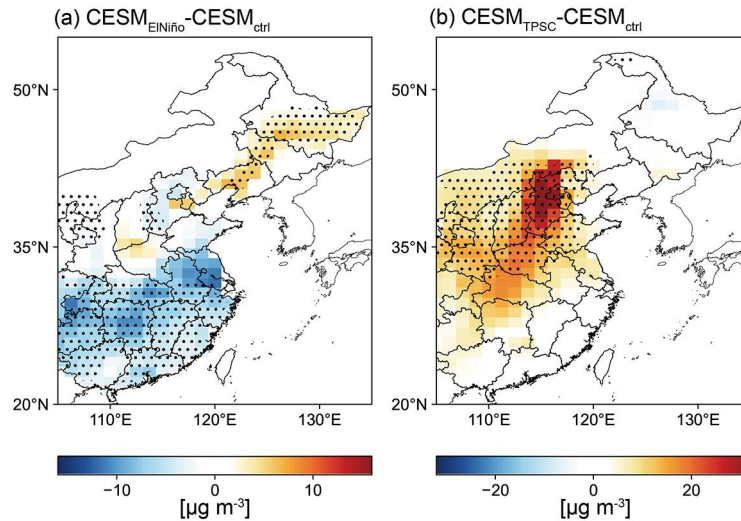
**Reviewer #1:** I appreciate the authors' efforts in revising the manuscript and addressing the comments raised in the previous review round. The revised version is substantially improved, and most of my concerns have been satisfactorily addressed.

I have only one remaining concern that should be clarified before publication.

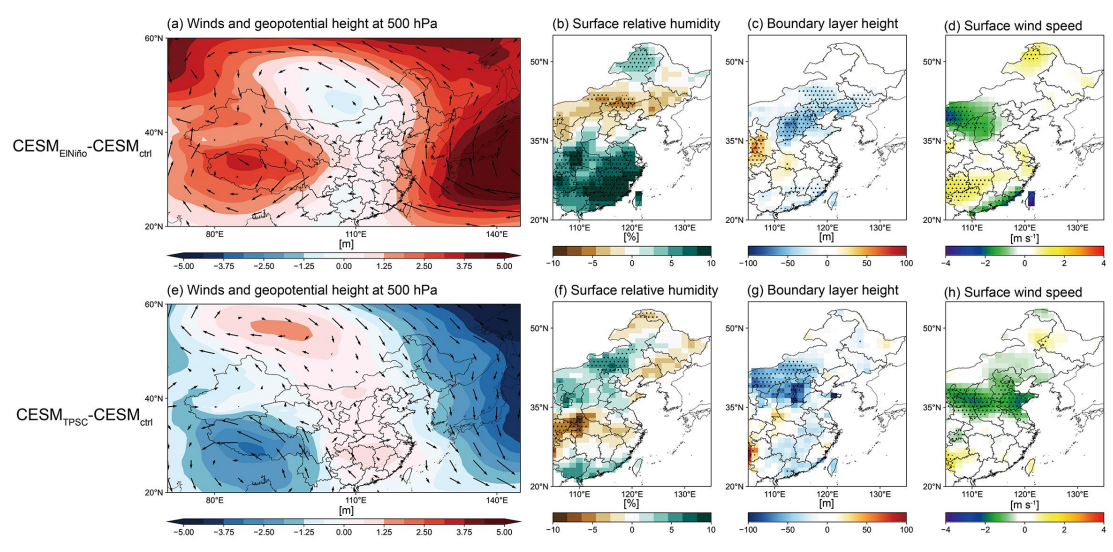
The authors acknowledge that the CESM sensitivity experiments are based on a single winter simulation and state that the model results are intended as qualitative process-oriented sensitivity tests rather than quantitative estimates of forced responses. However, Figure 5 now includes areas marked as statistically significant at the 95% confidence level. Given that the experiments cover only one winter and no ensemble members are used, it is unclear how statistical significance was estimated. The authors should explicitly describe the methodology used for significance testing in these simulations and discuss the limitations associated with such an assessment.

### **Response:**

- We would like to thank the reviewer very much for the positive and valuable feedback on our manuscript and providing us with suggestions and guidance. The significance test was performed using daily model outputs during the winter simulation period. We have added the following statement to the manuscript and clarified this procedure in the revised Figure 5 and Figure A6 captions.
- **“Surface PM<sub>2.5</sub> concentrations were derived from the model output by extracting the lowest vertical level of the simulated three-dimensional PM<sub>2.5</sub> field. Given the uncertainties in CESM-simulated PM<sub>2.5</sub> concentrations, model outputs are interpreted in terms of the direction and spatial pattern of PM<sub>2.5</sub> changes rather than their absolute magnitudes. Statistical significance was evaluated using daily model output during the winter simulation period.”**



**Figure 5.** CESM simulated responses of horizontal distribution of near-surface PM<sub>2.5</sub> concentration ( $\mu\text{g m}^{-3}$ ) over eastern China during winter to (a) Niño 1+2, and (b) higher albedo forcing over the northern TP. Dotted areas indicate responses that are significant at the 95% confidence level based on a two-tailed Student's *t* test applied to daily simulated anomalies during the winter period.



**Figure A6.** CESM simulated responses of (a, e) geopotential height (m, contour) and wind fields ( $\text{m s}^{-1}$ , vector) at 500 hPa, (b, f) surface relative humidity (%), (c, g) planetary boundary layer height (m) and (d, h) surface wind speed ( $\text{m s}^{-1}$ ) during winter to Niño 1+2, and higher albedo forcing over the northern TP. Dotted areas indicate responses that are significant at the 95% confidence level based on a two-tailed Student's *t* test applied to daily simulated anomalies during the winter period.