

Review of “Impacts of reductions in anthropogenic aerosols and greenhouse gases toward carbon neutrality on dust pollution”

Summary

This work evaluates future dust pollution by modeling different climate change scenarios that include changes in GHG and aerosol emissions using a global climate model. By including different SSP scenarios, they are able to assess different mechanisms, especially those that have counteracting effects on dust transport and deposition. The manuscript is well written and organized, but there are some aspects that can be improved prior to publication. Mainly, the novelty is not clear enough, the results are described more qualitatively than quantitatively, and lastly, there are not many comparisons of their results with other works. Below are some specific comments regarding these aspects.

Specific comments

- I suggest highlighting the novelties of the paper in the abstract, introduction, and summary. In the introduction, similar studies are mentioned. What are the main differences with those? Do your conclusions agree with all the mentioned studies?
- I suggest evaluating the title. I found it a bit generic, considering that there is a focus on specific regions, and that the selection of carbon neutrality scenarios is quite specific too.
- The abstract has a clear message, but quantitative results could greatly support their statements
- Experiment setup: As mentioned at the end of this Section, the model evolves in time. I don't completely understand when the simulations start and how fine the time resolution is, in terms of the prescribed aerosol concentration. Are all simulations initialized with the same aerosol conditions and only the emissions change in time (hourly?) and space, or do they also have different initial conditions? You can also tell us a bit more about how realistic the aerosol emissions are modeled, to better understand the simulation of these scenarios. Are anthropogenic emissions properly specified per region/country/city, and do they vary along the day? Another thing that I wonder is if the model is able to capture changes in vegetation, since it was mentioned as a possible agent in aerosol modification in the Introduction.
- On model evaluation, are the comparisons with CALIPSO performed along a whole year or a specific timeframe, and is it for the whole domain or a region of the space?
- How fine is the vertical resolution in order to observe PBL rising? If not fine enough, could this be a bias that enhances the surface wind strengthening?
- The mechanisms that drive the observed changes are carefully explained, especially those with opposite trends, which seems to be the main strength of this work. However, these changes are not quantitatively described nor compared with other studies. For instance, in L348 “significant reductions” could be quantified in a comparative way (as a % of the initial scenario, for example), in order to have a more complete description of their results.
- Fig. 1: “autumn”