



EGUsphere, referee comment RC1
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Comment on egusphere-2022-588

Anonymous Referee #1

Referee comment on "Where does the dust deposited over the Sierra Nevada snow come from?" by Huilin Huang et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-588-RC1>, 2022

Review of the paper "Where does the dust deposited over the Sierra Nevada snow come from?" by Huang et al., submitted for publication in ACP.

General comments

The paper aim at characterising the circulation types associated with dust deposition over the Sierra Nevada snow cover, by using SOM based clustering. The paper is well written, in a clear and concise manner. Motivations and objectives are clearly declared and put in the context of the existing knowledge. Methods are appropriated and clearly described. Conclusions follow from evidence. The findings discussed in the paper are relevant, and worth of publication. However, I believe that the paper could be further improved with a few modifications.

My first and main suggestion is motivated by the title of the paper, which questions the origin of dust deposition over the Sierra Nevada. I wonder why the authors didn't corroborate their findings by adding a back trajectories analysis. I really believe that the robustness of the results would significantly benefit from such an analysis, especially the part concerning the long-range transport.

I also wonder why the authors only analysed one year. Possibly because of limited computational resources. However, reliable reanalysis products are available (MERRA, CAMS) for analysis on the long term (even longer than the 11-year climatology presented in the paper), which could then be used to select one or more interesting years for more WRF simulations.

Specific comments

L36: what is "the dust prone area"? Can you be more specific?

L39: this sentence is not clear, premature mortality is rather a consequence of air-quality associated diseases (which include cardiovascular illnesses) than a direct impact. Please rephrase to highlight direct and indirect impacts of dust on health.

L183: too generic, please clarify what you mean by "projecting high-dimensional data into a two-dimensional grid".

L198: are these model levels?

L206: did you select the number of modes subjectively by testing the method, or did you use any objective methodology to assess distinctiveness and robustness? The approach used should be clarified. Also, how many EOFs have been retained before clustering? On which spatial domain the SOM method has been applied?

L210: remapping to a much finer resolution is not recommended, one cannot "create" the physical information not included in the coarser data. I suggest to remap WRF data to MERRA, and then validate.

L222: this is not evident from Fig. 2, can you provide a ref?

Fig. 2: please provide uniform colorbars, for better comparison.

Sec. 3.2: it would also be interesting to analyse the preferred transitions of circulation types along with persistence.

L274: how can we appreciate the dust deposition in Fig. 3?

L276: Fig. 6 is discussed before Fig. 5. Please change the order of figures (it also makes more sense to discuss local scale before teleconnections).

Fig. 5: could you add some reanalysis aerosol product to display possible transport paths across the Pacific?

L312: please provide a ref.

L314: how can we appreciate the dust deposition in Fig. 3c? (see also the comment to L274)

L342: showing some reanalysis aerosol product could also be helpful in visualising the transport pattern.

Fig. 11 and 12: please use the same colorbar as Fig. 3, for better comparison. In Fig. 11, the relative importance of the Mojave desert looks reduced in MERRA, any comment?

L465: can you please show and comment the interannual variability of the occurrence of the SOM clusters?

Technical corrections

L24: "We find that dust..."

L26: "mostly in winter and..."

L28: "in the presence of the NPH".

