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# Comment on acp-2021-818

Anonymous Referee #1

Referee comment on "Observed slump of sea land breeze in Brisbane under the effect of aerosols from remote transport during 2019 Australian mega fire events" by Lixing Shen et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-818-RC1, 2021

This study reported a reduction of sea land breeze (SLB), especially land wind speed associated with the great forest fire in Australia in January 2020. The author attributed the reduction to reduced surface downwelling solar radiation caused by increased aerosols, which serve to cool land surface more than the ocean, thus reducing land-ocean temperature contrast and wind speed. The conclusions are drawn through analysis and comparison of multiple observational and reanalysis products. While this find is plausible, it seems that there lacks a direct link between solar radiation and SLB strength. There are also some other minor issues that need to be clarified.

Major concern:

All the conclusions are drawn based on the fact that surface downwelling solar radiation is directly linked to the SLB strength. However, there is no analysis of the change of surface downwelling solar radiation over both land and ocean, as well as the change of land-sea temperature contrast, during the fire episodes. These data should be available from surface sites, CERES satellite product, and reanalysis data, although the latter two are more uncertain. In any case, a direct investigation of surface solar radiation as well as temperature anomalies should help clarify the mechanism proposed.

Minor comments:

- The result based on one site does not seem robust enough, as there may be other small-scale variabilities. Could the authors examine and compare several sites affected by the fire?
- Section 2.2: Have the authors checked the quality of MERRA-2 AOD? Maybe a comparison with MODIS will help. Re-plotting Figure 8 with MODIS data is also recommended.
- Section 2.2: Ground observation also needs quality control. Moreover, I wonder if for every month the observation is complete, i.e., there are full hourly observations on every day of the month? It may impact the SLB day statistics if there are missing observations on some days.
- Figure 5 is important, could the authors provide the correlation coefficient? Could they also show LW vs. downwelling solar radiation?
- Figure 7b caption: does the right panel show combined FRP from 2002 to 2019? I think a direct comparison should be made between FRP in 2020 and multi-year average, rather than multi-year sum.
- Line 464-465: This does not seem correct. BC should have a cooling effect on the surface rather than warming.
- Figure 13 does not seem quite useful.
- Section 3.5.2 and Figures 14&15, I wonder how the clustering of back trajectories is done? Is it manually or by some mathematical methods?
- Figure 16: This figure is great. But may also mark aerosols, or BC, OC, etc. Or this figure gives the impression that CO2 is the primary contributor to SLB slowing down. Also, since aerosols transported make a difference, the transport pathway should be marked on this figure.
- Some language still seems a bit awkward, with some typos. Please carefully proofread before resubmission.