

***Interactive comment on* “Statistical aerosol properties associated with fire events from 2002 to 2019 along with a case analysis in 2019 over Australia” by Xingchuan Yang et al.**

Anonymous Referee #1

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General comments: The manuscript “Statistical aerosol properties associated with fire events from 2002 to 2019 along with a case analysis in 2019 over Australia” discusses the contribution of biomass burning aerosols over Australia. Combining observation data and a trajectory model, it was found there was a significant difference of aerosol properties between biomass burning period and non-biomass burning period, and the impact of biomass burning aerosol is important. The data and methods used in this study are effective, the conclusions are partially reliable. However, there are still some concerns that need to be addressed.

Specific comments: 1. In this study, both ERA5 and MERRA-2 reanalysis datasets

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are employed. Why not use the same dataset for meteorological variables and aerosol reanalysis. For example, MERRA-2 reanalysis dataset includes wind field also, and ECMWF also provides aerosol reanalysis data (Copernicus Atmosphere Monitoring Service, CAMS). 2. Page 5 Line 179-180, how to get the conclusion of “similar emission from fires and regional transport of biomass burning aerosol in Australian continent” from the correlation between AOD and FRP, AOD and fire counts? 3. As shown in Fig. 8, the contribution of sea salt aerosol to the Australian continent is relatively small. However, the authors concluded that “The contributions of carbonaceous, dust, sulfate, and sea salt aerosols to the total aerosols were 26.24%, 23.38%, 26.36%, and 24.02% over Australia”. So, maybe the contribution of sea salt aerosols to the Australian continent was overestimated by calculating the aerosol proportion in the whole region. 4. Page 9 Line 360-361, the authors mentioned that the relatively high coarse mode aerosol volume concentrations in southeastern Australia was mostly related to the fire-induced dust emissions caused by the pyro-convection during extreme fire events. What is the evidence for this conclusion? 5. Page 4 Line 147, the authors mentioned the use of precipitation from ERA-5. It should be described in Section 2.2.3. Additionally, what is the purpose of using total precipitation data? Why not use satellite, station or grid data? 6. Page 1 Line 21, “Carbonaceous” should be “carbonaceous”. 7. Page 2 Line 45, “biomass burning aerosol” should be “biomass burning aerosols”. 8. Page 3 Line 106-107, “level” in “level 2.0” and “Level 1.5” should be unified as “Level”. 9. Page 3 Line 114-115, the full names of “DB” and “DT” are needed. 10. Page 6 Line 240 and Page 7 Line 257, is there some potential relation between the wildfire and dust events? 11. Page 7 Line 271, “MERRA” should be “MERRA-2”.

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