

Interactive comment on “Investigation of severe dust storms over the Pan-Eurasian area using multi-satellite observations and ground-based measurements” by Lu She et al.

Anonymous Referee #3

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General comments

The Study presented in this manuscript analyze in details large-scale heavy dust storm during May 2017 over Asia. Airborne dust originated from Gobi desert dispersed in several dust plumes, which propagated for several days in different directions. The authors used diverse sources of observations to generate the knowledge on origin, timing and spatial coverage of the dust storm, overcoming setbacks of one observational system with other sources of measurements, leaving no room for uncertainties in created hypothesis on this event. Scientific significance, scientific and presentation quality are good. Presented subject is of great significance because of the popularity

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of the topic, large impact of dust on climate system, but still not well understood and poorly represented in numerical models. Case study described here may be well used in further numerical models development and verification, since it is hard to correctly capture and describe fully any dust storm. This reviewer recommends this manuscript for publishing, after consideration of the following comments.

Specific comments

1) The title mentions in plural “dust storms”, but in the manuscript is analyzed one dust storm that dispersed in several dust plumes. In the text is also mixture in mentioning dust storm as single event and dust storms as plural. To avoid confusion the authors should decide to define this event as one dust storm that has divided in several dust plumes or to define this event as severe airborne dust transport, which consists of several dust storms with the same origin. This reviewer suggests defining described event as severe dust storm that has complex multi-plume propagation. Whatever the authors decide, title and the mentioning in the text of the manuscript should be changed accordingly. In the title should be the date of the event, to outstand that the study covers specific study case.

2) In the manuscript there is no analysis of meteorological parameters to be able to understand the atmospheric conditions that produced this severe large-scale dust storm. It is very important, to fully understand the event, to provide information about synoptic situation. To simplify this request it is enough to add the information on surface wind velocity and direction in the source region at the time of dust emission (or surface wind field), and to provide wind fields at representative height and/of geopotential heights (for example 500mb level) in representative times for later days. This would additionally explain the atmospheric circulation that carried dust particles. Data can be used from reanalysis fields.

3) Add information about source of input data for HYSPLIT model that produced backward trajectories.

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4) It would be very useful to add an image that presents hypothesis about dust storm propagation in different directions (or mark with arrows in Fig. 1), which is proved using many observations. It is hard to follow in case the geography of the region is not well known.

Technical corrections

1) line 26: change “10 mm” in “10 μm ”

2) line 55: change “10 mm” in “10 μm ”

3) line 59: change “Many studies have been carried out to study different aspects of dust plumes from deserts using...” in “Many studies have been carried out to study different aspects of airborne dust transport from deserts using...”

4) line 120: change “that can used to...” in “that can be used to...”

5) line 123: change “It has been suggested that...” in “It has been evaluated that...”

6) line 136/137: change “The inversion products includes both microphysical parameters ...” in “The inversion products include both, microphysical parameters ...”

7) line 146: change in “... during both, day-time and night-time.”

8) line 149/150: change in “...were collected to evaluate the dust-affected areas and to further analyse the transport of the dust plume.”

9) line 172: is it correct to have easterly wind in “... swept through the North China plain on 4 May 2017 due to a strong easterly wind,...”? It is not likely to have east wind, maybe west wind, which means that circulation was eastward?

10) line 215: exclude “The” at the beginning of “The This result is ...”

11) line 254: In the following sentence “Fig. 8 depicts the PM10 concentration distribution...” add an information about PM data values, are they hourly average of what? how many stations are considered?

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12) Letters in some Figures are too small, and require large zoom to be readable, especially Fig. 2, Fig. 4 and Fig. 9. If possible, use different rearrangement of plots and landscape mode.

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