

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-892

Anonymous Referee #1

Referee comment on "In situ observation of warm atmospheric layer and the heat contribution of suspended dust over the Tarim Basin" by Chenglong Zhou et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-892-RC2>, 2021

This work combined the radiosonde observations, reanalysis data as well as satellite images to investigate the possible impact of dust on meteorology. The authors found that there might be an anomalous warm atmospheric layer caused by suspended dust over the Tarim Basin, with a maximum heating effect of approximately +0.45 K and +0.25 K in spring and summer, respectively. The research topic is of interest. However, the descriptions on the utilized dataset ought to be detailed and also its applicability needs to be justified. I have the following questions and suggestions to the authors.

My main concern is that the authors claimed that "the ERA-5 data are generated from an ECMWF IFS

spectral model and do not yet assimilate the impact of aerosols on meteorology", but "the MERRA-2 data include the impact of dust on meteorology". Actually, both the two data are reanalysis, which means that they have assimilated tremendous atmospheric observations, including temperature measurements. Here is the detailed information on the data assimilation system for ERA-5 and MERRA2. The fact is that since 1997, ECMWF operations have applied 4D-var assimilation system.

<https://www.ecmwf.int/en/elibrary/20196-ifs-documentation-cy47r3-part-ii-data-assimilation>.

<https://journals.ametsoc.org/view/journals/clim/30/14/jcli-d-16-0758.1.xml>

These data assimilation systems do constrain the forecast by using surface observations, balloon data, aircraft reports, buoy observations, radar and satellite observations. Once the temperature and other meteorological fields are assimilated, the impact of aerosols on meteorology is certainly included in the reanalysis data. Investigations on relevant

literature are highly suggested, based on which I also suggest the authors to reconsider the method or the datasets used in this work.

The northward extension of the Tibetan heat source proposed in 3.4 is somehow descriptive and hypothetical. I think in-depth data analysis and solid evidence should be provided while a scientific conclusion is drawn.

I also recommend language editing for improving the accuracy of language as well as overall readability.

Minor issues

Line 75: What is "ground-based radiosonde observations"? Do you mean ground-based and radiosonde observations?

Line 85-92 need to be rephrased.

Line 104: correct reanalyzes to reanalysis

Figure 3 is a little confusing and unclear since that it uses the size of markers to show the temperature difference. It might be more distinct while using gradient color.

The label in Figure 4 is too small to be clearly identified and needs to be improved. Figure 5 has the same problem.