

Interactive comment on “Simulated enhancement of ENSO-related rainfall variability due to Australian dust” by L. D. Rotstayn et al.

Anonymous Referee #1

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General: This paper compared ENSO-rainfall relationship over eastern Australia between simulations with and without dust radiative effect. It found that dust effect induces drier conditions at dry (El Nino) years but wetter ones at wet (La Nina) years, leading to a significant negative relationship between Nino 3.4 SST and rainfall anomaly over eastern Australia, which is close to the observations. Simulations without dust effect failed to reproduce such relation, indicating the importance of dust in modulating ENSO-related atmospheric responses.

The subject is interesting and appropriate for ACP. Some minor revisions are required before the publication.

Major comments:

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1. The cause for the strengthened ENSO-rainfall relationship over eastern Australia by dust is not well explored. The authors mentioned that dust have both positive and negative effects on local rainfall. However, this information belongs to the discussion rather than the analysis of results. The authors may need to do some diagnosis of the dynamic circulations (e.g. vertical convection as shown by Lau et al., 2006, atmospheric stability changes as shown by Miller et al., 1998) before they conclude the ‘possible’ mechanism in page 1612.

2. Page 1607, lines 18-24: why there is an increase in surface air temperature after considering dust radiative effect, even for the daily maxima? The two studies the authors referred to (Washington et al., 2006 and Yue et al., 2010) showed decrease in the daily maxima (at the local noon or early afternoon) due to dust scattering effect.

3. Why the profile of atmospheric heating by dust (upper panel in Fig. 11, centered at 130°E) does not match the location of maximum surface response (bottom panel in Fig. 11, centered at 137°E) and the vertical profile of dust concentrations (Fig. 12, centered at 140°E).

Minor comments:

4. Equation (1): there may be an incorrect additional right parenthesis in the equation.

5. Equation (3): what’s the difference between V_{eff} and U_{10m} ? Are they the same in your model description?

6. The left color bar of Figure 2 seems incorrect.

7. What’s the observation for rainfall in Figure 5. Is it from the Australian Water Availability Project as you mentioned in section 3.3? You need to introduce it a little earlier.

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