

Interactive comment on “Observed 20th century desert dust variability: impact on climate and biogeochemistry” by N. M. Mahowald et al.

Anonymous Referee #3

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General comments:

This study uses available paleodata observations to reconstruct dust variability during the 20th century at various source areas over the globe and a set of models to estimate the global changes in dust sources, distribution and depositions, and the impact of these changes on climate and biogeochemistry. Dust effect on climate is a very relevant current research topic and indeed here it is shown that dust may significantly impact the global climate. The manuscript is well-written, framework and motivations are well described. The approach and methodology are comprehensive and well-grounded, despite several simplifications and uncertainties (in general acknowledged). I recommend the manuscript for publication after a minor revision.

Specific Comments:

C7388

P12587 L1: also indirect effects are important. P12589 L18: how can changes in transport (related to circulation changes) be neglected? P12594 last paragraph: the description of the model simulation is not completely clear. L17 at page 12593, L10 at page 12594 and L1 at page 12595 seem to repeat. I do not understand how the model is able to vary the source strength with wind and humidity while the variability is forced to match the observations. How bad is the model dust variability without tuning? P12601, Section 3.2: to extend the validation of the model results over ocean (where P is not available), could you check with sea level pressure data (e.g., the multi-century dataset from the Hadley Center)? Moreover, as far as Figs. 4 and 6 are concerned, I would add also the distinction between land and ocean T variations due to dust.

Technical Comments:

P12587 L13: replace aerosols with dust, and use heavy loaded instead of dusty (to avoid repetitions) at L 14. P12587 L17: from desert dust changes P12588 L10: by instead of through, for instead of during. P12589 L1-2: ...about past variability of dust. Here... P12590 L7: ...other studies are characterized by a too large Australian source. P12593 L17: For dust modeling, ... P12594 L9: ...as Flanner et al. (2009). P12595 L20: including P12596 L8: repeated annual cycle P12618 Tab. 3: check the last row, the reference is in the 3rd column (and not 4th) P12620 Fig. 2: add “relative change” on the y axis. Replace “time trend” in the caption with variation. P12624 Fig. 4: (c) is missing. Put (a) and (b) at the beginning of the sentence. P12626 Fig. 6: Obs. T in panel d should be replaced by Obs. P (it is precipitation)

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 12585, 2010.

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