

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

Anonymous Referee #1

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Review of Observed 20th century desert dust variability: impact on climate and biogeochemistry

Mahowald et al.

General comments:

In this paper Mahowald et al. study the variability of desert dust in the 20th century based on paleodata from around the world. By combining the data with different models representing the atmosphere, ocean and land the impact on biogeochemistry and climate is investigated. The impact of dust and the differences in radiative forcing between dusty and non-dusty periods is significant. This study is hence an important contribution to our understanding of the climate system. There are major uncertainties

C6568

associated with this type of study, but a detailed discussion and estimates of these are given in the paper.

I recommend the paper for publication in ACP as the topic is highly relevant. The data handling, methods and associated assumptions seem sound and the applied models are, to my knowledge, current state-of-the-art. There is one assumption/method that to my opinion should be better described before publication, see below. Apart from that, I have only minor comments and corrections. The paper is well written and well founded in existing literature.

Specific comment:

Page 12587 Line 1-2: Desert dust ... interacting with incoming ..., thereby changing precipitation ... As you write later in the paper dust can also change precipitation patterns by acting as cloud condensation nuclei – so could this first sentence be reformulated in order to be more precise?

P 12594 L20: We then conducted simulations where we forced As I understand it, this is what you later call “the inversion”? Use this term here also to make it clear. It is still hard for me to understand that the variability in the atmospheric transport is not an important factor for the variability seen in the data. ... Also is not clear to me how you by this method constrain the dust sources based on the depositions and still allows the sources to vary as a function of winds and soil dryness. Please extend this section with a more detailed description of your assumptions and the method.

P 12599 Paragraph starting at line 19: same issue as above. The relative deposition time series you use to modify the source strength – does it not include a temporal variability? Because then it is of course not a surprise that the model captures the variability.

Technical comments:

P 12587 L 6: ..whether human were in the net increasing or ... There is something

C6569

wrong with this sentence.

P 12594, L 9: ...historical forcing as (Flanner et al., 2009). Should be: .. historical forcing as Flanner et al. (2009).

P12595 L 20: The impact of the including dust There is something wrong with this sentence/spell error.

P12603 L 23: Much of the change terrestrial ... Missing of/in after change.

P 12605 L 20: A “.” should be moved.

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

C6570