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Atmospheric Chemistry and Physics Discussions

Interactive comment on "What controls the recent changes in African mineral dust aerosol across the Atlantic?" *by* D. A. Ridley et al.

Anonymous Referee #2

Received and published: 8 April 2014

This manuscript proposes a novel link between atmospheric circulation-driven changes to the surface wind stresses in the Sahara and changes to the dust cycle leading to a decrease in dustiness over the Sahara. This mechanism is interesting, and while the support for the hypothesis seems tentative at this stage it is definitely of wider interest. I recommend publishing subject to only the minor revisions below.

p 3585 l. 15-17 positively or negatively correlated?

p. 3596 Could you describe in more detail the wind aspect of the experiment? The lowermost winds have two functions: they define the surface wind stress used to drive saltation and dust emission, but also play a minor role in the transport of emitted dust. Did you hold fixed both aspects of the surface wind, or only the surface wind stress

component?

The mechanism outlined in section 5 would in principle seem to be a feedback, in that decreased aerosol loading leads to reduced wind stresses and therefore further reduced aerosol loading. Would the opposite also occur, whereby increased aerosol leads to increased dust generation, or is the aerosol type (sulfate vs dust) and/or geographic region sufficiently different that this would not be likely to occur? Are there simple scaling arguments for how strong such a feedback might be, if present?

Why do you assume that the AIE is required for the aerosol-induced stilling; shouldn't the direct aerosol radiative effect also lead to changes (albeit weaker) in the response? If so, why consider the models with and without AIE as a categorical distinction rather than one of overall strength of the total aerosol direct + indirect effect?

The two main ideas explored in the paper (revising the dust source function vs. understanding the decline in dust emissions) could be tied better together in the manuscript. Is there a mechanistic link, for example is the first part required to get reasonable results in the second?

Fig. 9: I can't actually see the difference between grey and green lines here for most of the panels, are they completely overlapping? If so, would be useful to point that out in the caption. Also, I find it interesting that the far S. America, the transport does play an important role. Does this imply that changes to the interhemispheric transport are occurring?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 3583, 2014.