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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying local-scale dust emission from the Arabian Red Sea coastal plain" *by* Anatolii Anisimov et al.

Anonymous Referee #1

Received and published: 20 September 2016

The authors study the emission of dust from the Red Sea Arabian Coastal Plain using an off-line land surface model and compare with weather station reports, and attempt to identify emission temporal and spatial patterns and estimate dust composition.

Major revisions would be necessary to reach the scientific and presentation standard of ACP.

Major Comments: ========== Section 2.1: The authors concentrate on a narrow (∼100km) coastal plain with complex circulation (e.g. sea breezes) but use a model resolution that is too coarse (10km). They use the same resolution also when testing varying emission resolutions. Even if this is due to computational constraints, surely short tests of specific dust events can be conducted at higher resolution to properly test dust dispersion. Can the authors identify such events and complement the paper

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with higher resolution model runs?

The authors allude to a year-to-year strong variability (Sec.2.3, p.7 l.18), yet only simulate the short period of 3 consecutive years. Are the results meaningful and how are any resulting systematic uncertainties constrained?

The authors do not address dust aging and its potential effects. They should comment if it's relevant before deposition. Does short atmospheric residence time make it not significant?

Section 2.2 describes mostly the dust generation mechanisms that I understand is not the authors own work and is available in the literature. The whole section should be shortened, replacing the details of model parameterisations with references.

Section 2.4,5: Given the very coarse resolution and the relatively small size and high complexity of the region under study of the MERRAero grid, is it advisable to scale to the emission total? What is the overall point of this section? Sections 2.4 and 2.5 should be merged.

Section 3.1: Given the same forcing in all experiments, and differences of a few percent between emission resolutions, what is the point of sensitivity tests? Surely the sensitivity to meteorological conditions and climatic variability is more important and should be studied. The authors should comment and better motivate their study.

Section 3.2: Surely statistical testing can't involve changing thresholds until significance is reached. Also are monthly values used when hourly are available? Given the strong diurnal variability, isn't the latter advisable?

Section 4: Again given varying vegetation and land type, isn't 3 years to short a time span to produce an emission climatology?

Minor Comments: ========== Using the study-specific acronyms FineALL, HighALL, LowALL, etc. is confusing to the reader. Propose to just change with quoting model resolution and if necessary input data (ie. 1km, 10km, 50km, etc.)

Please include the span of years modelled in the abstract.

Abstract l. 26: appears to be -> is estimated to be [...] suggests -> shows

p.9 2nd paragraph: First it's stated that it is not rare to have no dust reports, thus the visibility measurement is used, then that the authors prefer sampling as most station visibility are complemented with weather codes. Aren't these statements contradictory? Please re-write the paragraph for more clarity.

p.9 l.11 current month -> that particular month

p.13 l.9 Please elaborate how Yu et al is questioned based on the results of the present study - not just by quoting another paper.

p. 19 l.8 Paragraph/line incomplete? Missing full stop?

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