

Interactive comment on “Development of a dynamic dust-source map for NMME-DREAM v1.0 model based on MODIS NDVI over the Arabian Peninsula” by Stavros Solomos et al.

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Manuscript: Development of a dynamic dust-source map for NMME-DREAM v1.0 model based on MODIS NDVI over the Arabian Peninsula

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Reviewer: Enric Terradellas

Overall recommendation: Accept subject to minor revision

Rationale: The dust source map is one of the key aspects of the parameterization of

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the dust processes into NWP models. One of the biggest problems in the definition of sources is that soil conditions for dust emission change over time, cyclically throughout the year and with much less predictable inter-annual variations. Therefore, the introduction of dynamic dust source maps, based on satellite remote sensing products, seems a necessary step forward. The authors describe the implementation of a map of this type and show that with it the model considerably improves its performance.

Comments for authors:

• Introduction. You should mention here previous attempts to scale the dust emissions by satellite NDVI that you mention in Section 3 (Summary and Discussion). You should emphasize the difference of your approach (if there is any).
• page 1, line 7: The expression ‘The new modeling system’ seems excessive, when you only change the dust source map.
• page 1, line 7: “. . . is tested for the analysis of dust particles dispersion...”. I assume that the model simulates emission and deposition, not only dispersion. Moreover, the new map influences dust emission. So, why do you write you analyse dispersion?
• page 1, line 13: “The modeled AOD bias is improved from -0.140 to 0.083”. It is not necessarily an improvement, since you compare dust AOD with total AOD. A positive bias is always bad news, whereas a bias of -0.14 may be acceptable. Going from -0.933 to -0.424 that does seem an improvement.
• Page 1, line 27: Some spaces between words are missed: ‘studies.Dust’ in page 1, line 27; ‘(CCN)and’ or ‘precipitationprocesses’ in page 1 line 31 and so on. Please, check it.
• Page 2 line 54: define ‘SSib’
• Page 2 line 69. I would not say that the Arabian Peninsula is a good example of heterogeneous region.
• Section 1.1. Although there are references on it, I would include a short paragraph describing the main aspects of the dust model (emission, deposition schemes, whether or not there is radiative feedback, ...)
• Page 3 line 93: I would suggest ‘nonlinear partial differential equation’ instead of ‘partial differential nonlinear equation’
• Page 3 line 111: ‘TheNDVI dataset is at finer resolution than the model grid’. Which is the resolution?
• Page 3 line 117: ‘we have applied a limit to dust efficiency over high mountain’. I

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think it would be worth explaining it a little. A limit on a threshold altitude? â€” Page 3 line 124 & page 4 line 152: In other parts of the text, you mention that the NDVI product is a 16-day average. Here, you present it as a monthly product. Please, clarify. â€” Page 4 line 137. Please, check the ratio's denominator in the equation below. â€” Page 4 line 138. 'top of the atmosphere reflectance'. Shouldn't be surface reflectance (measured from the top of the atmosphere)? â€” Page 4 line 144: 'The high resolution masks was used... '. I don't understand what these masks are. I suppose you use the equation of line 113. In any case, '... masks were used...' â€” Page 5 line 175: 'Arabian Gulf'. I don't want to participate in a naming dispute, but in most international treaties, documents and maps, this body of water is known by the name of Persian Gulf. â€” Page 6 line 184: I suppose you should comment on the deficiencies of the monthly average of MODIS AOD. I mean that the daily datasets do not cover, far from it, the entire territory due to the presence of clouds, excessive zenithal angle, etc. â€” Page 6 line 195: 'miss-classification of Iran and Pakistan grid points'. The overestimation along the Iran-Pakistan coastline is very striking. Can you guess a possible cause of this miss-classification here? â€” Page 6 line 200: 'measurements of AOD?'. Please, replace measurements with retrievals. â€” Section 2.2: In the first paragraph you compare monthly averages of MODIS AOD with monthly averages of simulations. You should explain what you compare in the second paragraph: monthly averages, timeseries with individual retrievals, daily averages, ... â€” Page 7 line 218. Please, re-phrase the sentence starting with 'The bias reverse is evident ...' â€” Page 7 line 236. the sentence starting with 'These may include bog, marsh, ...' should be revised. Probably you refer to dried or dessicated bog, marshes, ... â€” Different formats are used for citations. Please, check it.

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