

Interactive comment on “Sensitivity of the WRF-Chem (V3.6.1) model to different dust emission parametrisation: Assessment in the broader Mediterranean region” by Emmanouil Flaounas et al.

Anonymous Referee #2

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General comments

This article presents an assessment of the ability of the three-dimensional WRF-Chem model to simulate the transport of dust over the Mediterranean, for a set of dust parameterizations, and over several periods of spring and summer 2011. Model output data are evaluated in comparison with AOD measurements derived from satellite observations, ground-based AERONET stations and airborne lidar-derived extinction coefficient measurements. They focus on the main source area (North Africa, the Arabian Peninsula) and on the Eastern Mediterranean basin. The impact - on this comparison

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- of the use of dust emission adjustment coefficients is also investigated.

This topic is of major importance in the Mediterranean, an area which shores are highly populated, which is sensitive to climate change (partly due to atmospheric aerosols), and which is exposed to air quality degradation due to the recurring import of gaseous and particulate pollutants from the surrounding continents.

The model has previously been shown to correctly reproduce meteorological features. The work is of quite good scientific quality, and fits the GMD topics as it proposes a critical analysis of 3D dust emission and transport modelling and aims at the determination of an adequate model set-up.

The questions that arise are the following :

How is the erodibility value obtained? Does the use of a dust flux coefficient aim at scaling this value to better represent dust release during ad hoc wind conditions? Or does it aim at correcting dust emission parameterizations?

§3.1 The authors largely describe the impact of dust flux coefficients on the model skills, in terms of under- or over- estimation. But the analysis of the results remains largely descriptive and not comprehensive. How do the authors explain the spatial heterogeneity in the skills when using the coefficients? Does it come from non-homogeneous quality in the erodibility field above the different areas? Or could it be explained by local soil features that are not all taken into account in the parameterizations? May this come from non-homogeneous local meteorological skills (wind speed restitution)? This issue is only slightly discussed in the conclusion.

§3.4 It does not appear completely satisfactory that the evaluation of the model on the vertical is made using the simulations with the “best local” dust flux coefficients, which are not the same for all parts of the simulation domain. At least, the evaluation of relevance of the model output should thus be limited to the qualitative aspects (restitution of vertical shapes...), and not quantitative ones such as the restitution of the “magnitude

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of the extinction coefficients derived from lidar” (line 437).

Technical comments

Line 214 - Reference for AERONET should be given at the first mention of the network and not lately.

Line 522 - “13” should be removed from the sentence.

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-313, 2017.