

Interactive comment on “Description and evaluation of GMXe: a new aerosol submodel for global simulations (v1)” by K. J. Pringle et al.

Anonymous Referee #1

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This manuscript describes a new or, more precisely, an undated aerosol sub-module for global modeling purposes. The model has been adequately described and evaluated in a sufficient detail against atmospheric observations. The paper is scientifically sound and well written. There are a few issues that should be addressed before acceptance for publication in GMD.

Section 2.2: From the description it remains unclear whether EMAC produces the concentration fields of gas phase species, or their production rate fields. I suppose it should be production rate because many of the gaseous species are lost irreversibly to the aerosol phase, or are partitioned between the two phases.

Section 3.2.2: Is the model capable of dealing with nucleation schemes other than the binary one?

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Section 3.3: The author should mention how they treat the cloud droplet activation of aerosol particles, and how this is coupled to aqueous-phase chemistry described in section 2.3.

Section 3.3.3: The authors assume that organic aerosol species do not uptake water, which is contrary to observations. This has probably little effect on the aerosol liquid water content, but it might influence the aerosol cloud droplet nucleation activity (see also the comment above).

Section 3.3.4: This is a well-documented and proper approach. However, where are the assumed values of accommodation coefficients (page 582, line 9) taken from?

Section 3.4: Physically, the cloud droplet nucleating activity of an aerosol particle has little to do with the number of monolayers of soluble material on it. The authors should be justify their approach and explain why they have chosen 5 monolayers instead of 1 used in M7.

Section 4.2.1: The authors explain the modeled bias in sea spray concentrations as an artifact due to strong concentration gradients in coastal areas. How about elsewhere? It is well know that current sea spray emission modules have an uncertainty of at least a factor of 2-3.

Section 4.6 and Figure 13: Although most of the modeled values of AOD are within a factor 2 from those measured by AERONET, the scatter appears to be relatively high. Maybe the authors could comment this feature a bit.

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