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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source contributions to 2012 summertime aerosols in the Euro-Mediterranean region" *by* G. Rea et al.

Anonymous Referee #3

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This study aims at quantifying the contribution of different aerosol sources over the Mediterranean area in summer 2012. A "reference" model simulation is compared to observations from surface network and remote sensing (AirBase, AERONET network, and the MODIS satellite instrument). Sensitivity simulations are performed: simulations are performed without mineral dust emission, without anthropogenic emission, without fire emission and without sea-salt emission. These simulations are compared to the reference simulation to quantify the impact of the sources on PM25 and PM10 concentrations.

In the model description, the authors mention that adsorption and desorption are taken into account in the model. I am however extremely surprised that they omitted absorption, one of the major process governing aerosol dynamic.

Although the kind of source apportionment done in this paper without considering the non-linearity of chemistry may be applied to inert chemical compounds such as dust, it does not apply to reactive chemical compounds. For example, most biogenic precursors may not condense onto particles without prior oxidation from anthropogenic-origin oxidants. The absorption of anthropogenic compounds onto particles is also influenced by biogenic compounds. The interaction between biogenic, anthropogenic and fire emissions also needs to be considered, when assessing the influence of fire emissions. For reactive species, different methodologies exist to determine source-receptor relationships: direct decoupled sensitivity analysis or emissions-labeled tracers analysis. Neglecting the non-linearity of chemistry when performing source apportionment, as done here, is very misleading and leads to misleading conclusions and messages.

Therefore, I do not recommend this paper for publication, until the authors consider absorption in their model, and revise the methodology used for source apportionment or focus on the impact of inert compounds.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 8191, 2015.