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***Interactive comment on* “Linking climate and air quality over Europe: effects of meteorology on PM_{2.5} concentrations” by A. G. Megaritis et al.**

Anonymous Referee #2

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Review on manuscript: “Linking climate and air quality over Europe: Effects of meteorology on PM_{2.5} concentrations” by A. G. Megaritis, C. Fountoukis, P. E. Charalampidis, H. A. C. Denier van der Gon, C. Pilinis, and S. N. Pandis The manuscript studies the effects of individual meteorological parameters on PM_{2.5} concentrations over Europe, derives the sensitivity of PM_{2.5} to changes in each of the considered parameters and finally estimates the impacts of those meteorological parameters on future PM_{2.5} levels due to projected climate changes. The work has definitely a relevance to understanding how/why climate change may impact air quality, though the work does not offer any substantial novelty.

Some general comments: 1. As meteorological effects on PM_{2.5} are central in this work, the model’s ability to reproduce observations in various meteorological condi-

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tions should be discussed in a more clear and transparent manner. I'd recommend to either make a summary about that in the end of Model evaluation part, or better to re-write the model evaluation, looking at each of the individual PM components and analyzing the model ability to accurately calculate it in different seasons. The bottom line is that Model Evaluation should be made shorter, more reader-friendly and (!) should make a clear statement how good/bad the model performance is at variable meteorological conditions. 2. I'd recommend to shorten sections 5 through 9, especially with respect to the amount of numbers, as it is rather hard for a reader to consume all these quantitative information. It is shown in Figures anyway. 3. Calculating the relative importance of meteorological parameters on PM_{2.5} (sec. 10), the authors assume the same meteorological changes all over in Europe. As climate predictions indicate, there will be regional differences in the change of different meteorological parameters (for example, larger increase of winter temperatures in Northern Europe and smaller in Central/Southern Europe, whereas the opposite in summer). Those differences will overlay the differences in chemical regimes around Europe (thus different predominating PM components possessing different properties). Could the authors discuss on if/in which way these inhomogeneities may have significant effect on the main conclusions. Other comments: p. 10347 lines 9-10. Introduction: "Over past decades, increased levels of . . . PM" - do the authors imply that PM levels have been increasing? Everywhere? - Then references should be made. Anyhow, PM is affecting both human health and climate even at average (background) levels. p. 10348, 10367: Better to refer to the latest IPCC report (2013) p. 10349, 4-5: "increasing mixing height in S-E Europe – above 100 m" - probably means "increase by more than 100 m"? p. 10355, 16-21: The authors explain the model over-prediction of PM₁ nitrate and ammonium in Mace Head by the assumption on bulk equilibrium and shift to coarse mode. But would not this cause in less fine ammonium nitrate? p. 10368, 9-11: "During all seasons, the increased volatilization of ammonium nitrate dominates, causing large decreases in PM_{2.5} with increasing temperature". However, it seems from the model evaluation tables S1 and S3 that modeled nitrate tends to be too sensitive to temperature. Could

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the authors comment on this.

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C4527

