

Interactive comment on “Analysis of the atmospheric composition during the summer 2013 over the Mediterranean area using the CHARMEX measurements and the CHIMERE model” by L. Menut et al.

Anonymous Referee #2

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This paper analyzes the aerosols and ozone variability over the Mediterranean area during the CHARMEX measurements period. The methodology is based on the comparison between CHIMERE simulations and different sets of observations. The topic is very interesting. Unfortunately, the model-to-data comparison is too briefly discussed. Also, the good CHIMERE performance is overstated throughout the paper while taking a look at tables and figures gives evidence of clear model deficiencies. I encourage the authors to rephrase the discussion in a more moderate way and to include a more in-depth analysis of model uncertainties. For example, a comparison of simulations with

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aerosol size distribution and single scattering albedo from AERONET measurements should be added.

As CHIMERE biases could also come from uncertainties in the WRF simulations, the evaluation of simulated meteorological parameters should be maybe completed by using a large set of observations from the European Climate Gridded database that the authors used in a previous paper (Menut et al. 2013)

Please find below my specific comments:

- Page 23079 L 4-5: Please justify
- Page 23079 L 18-20: Give some examples of results
- Page 23080 L 4: Which developments ?
- Page 23080 L 15: What were the performances of WRF-CHIMERE compared to the other models ?
- Page 23082 L9: Why the comparison is relevant for ozone but not for NO₂ ?
- Page 23084 L 8: The study of Levy et al. 2010 is only for data over land.
- Page 23086 L 25-27: Do aerosols have an influence on the modelled photolysis rates ?
- Page 23089 L 17-21: Biases are clearly seen also near the surface.
- Page 23090 L 10: The sensitivity depends also on the wavelength
- Page 23090 section 5.1: a statistical comparison between MODIS and CHIMERE should be more precise
- Page 23091 L 10: For most of the time, the modelled AOD is not very close to the measurements.
- Page 23091 L 23-24: authors mention a possible bias in the modelled aerosol size

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distribution. A comparison with AERONET aerosol size distribution over available site should be added.

- Page 23091 L 26-27: Uncertainties in measured AOD are low (0.01 see Holben et al. 2001) compared to model biases.

- Page 23092 L24: "[...] the bias remains low [...]": I disagree. A bias up to 90 % (Chitignano) is not low.

Technical corrections:

- Please explicit accronyms when first use

- Page 23077 L 12: add "of" before "the atmospheric"

- explicit BL and FT on Figure 1

Bibliography:

- Menut L., O.P.Tripathi, A.Colette, R.Vautard, E.Flaounas, B.Bessagnet, 2013, Evaluation of regional climate simulations for air quality modelling purposes, *Climate Dynamics*, doi:10.1007/s00382-012-1345-9, volume 40, issue 9, pages 2515-2533

- B.N. Holben, D. Tanré, A. Smirnov, T.K. Eck, I. Slutsker, N. Abuhassan, W.W. Newcomb, J.S. Schafer, B. Chatenet, F. Lavenu, Y.J. Kaufman, J.V. Castle, A. Setzer, B. Markham, D. Clarck, R. Frouin, R. Halthore, A. Kameli, N.T. O'Neil, C. Pietras, R.T. Pinker, K. Vass, G. Zibordi: An emerging ground-based aerosol climatology: Aerosol optical depth from AERONET, *Journal of Geophysical Research*, 106 (2001), pp. 12067–12097

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