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Interactive comment on “Ozone and aerosols tropospheric concentrations variability analyzed using the ADRIMED measurements and the WRF-CHIMERE models” by L. Menut et al.

Anonymous Referee #2

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Review of the paper "Ozone and aerosols tropospheric concentrations variability analyzed using the ADRIMED measurements and the WRF-CHIMERE models" by L. Menut, S. Mailler, G. Siour, B. Bessagnet, S. Turquety, G. Rea, R. Briant, M. Mallet, J. Sciare, and P. Formenti.

The material presented in the paper is of interest both in terms of results of comparing the measurement data obtained during the ADRIMED campaign and the results of simulation with the WRF and CHIMERE models, and from the point of view of studying variability of aerosol characteristics and ozone content over the Mediterranean basin. The article can be published in the ACP, but the text of the paper need to be meticu-

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lously edited.

Authors write that “The main purpose of this study is to better understand ozone and aerosols content in the lower troposphere over the Mediterranean area, using a combined analysis of atmospheric measurements and regional CTM simulations”. However, this version of the manuscript for the most part is devoted to the comparison of the simulation results and observation data obtained during the ADRIMED intensive campaign from 1 June to 15 July 2013. Issues concerning the state and variability of ozone and aerosols over the Mediterranean area during a specified period are not reflected comprehensively enough. It seems to me, when discussing the variability of these characteristics, the specifics of ADRIMED campaign period could be described in detail concerning the situations which are typical for this region, and (or) the season. Another alternative is to formulate the objectives of this work more specifically and clarify the more specific objectives of the study in the introduction.

In the work, the WRF and CHEMIRE regional models are used. The authors point out the names of schemes and modules that are used for simulation of the atmospheric characteristics: for example, MELCHIOR 2 – to describe the chemical evolution of gaseous species, Fast JX radiation module – to calculate photolysis rates, etc. One of the main characteristics, which are considered in the article, is the aerosol optical depth (AOD). Comments made by the authors about the features of AOD modeling are presented very scarce. One can agree with the authors and lead only references to the literature in which the features of the model are described in detail (Section 3.2). However, comparison of the observation data and simulation results show that in some cases the serious discrepancies exist. Therefore, it is advisable to give a brief description of some of the most important – in relation to the purposes of the article – paragraphs that would be useful in the analysis of differences between observations and simulation results.

When analyzing quality of the model by comparing simulation results and observations, the qualitative assessment is often used: P. 3073: “It was shown that the

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model is able to accurately reproduce the main meteorological variables over the Euro-Mediterranean area and to provide realistic enough fields for chemistry-transport modeling". P. 3074: "For the 2m temperature, we note that the observed and modelled values are similar. ... For Pr, the main structures and the relative amount are also well modeled". It would be more accurate to adduce the quantitative estimates indicating to which atmospheric situations (dust outbreaks, fire, background conditions, etc.) these estimates belong.

Considering the AOD and the particle size distribution, the data from AERONET sites, located in Africa or the Mediterranean islands, are used. Why not consider data on continental stations, located in Europe? Especially since the European stations were selected (Figure 2) when considering data on ozone and PM10.

In parts devoted to the analysis of meteorological parameters and ozone surface concentrations (Sections 4.1 and 5.1) the daily maps for 3 days (16, 20 and 24 June) are considered. Why these three days?

In Section 5.2, the results are divided on the basis of coastal or continental station type. It would be preferable, apparently, to use the criterion of distance from the coast station.

The text of the article includes a large number of acronyms (EUCARRY, CHIMERE, ESCOMPTE, etc.) which are not explained at all or decoded immediately after the first mention. Apparently, it is advisable to bring a list of acronyms in the table or in the application.

The phrases stating the purposes of the work are often appeared throughout the text. Therefore, the paper is losing its entirety.

Other comments: # There are many inaccurate phrases and expressions which are difficult to interpret, for instance:

P. 3066: "... composition. The latter depends on the relative contribution of various

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chemical species such as . . . ”;

P. 3069: “In order to the modeled meteorology, . . . ”;

P. 3073: “This WRF model configuration. . . ”. In my point of view, it is not the best way (with the words ‘This WRF model . . . ’) to start new Section.

P. 3077: “The most important surface concentrations. . . ”, P. 3083: lines 14-16, “too important”. It is not clear what is meant by ‘important’.

P. 3077: “Results are split as a function of the AirBase surface station type. . . ”;

P. 3079: “For measurements near the surface, the model is mostly closer to the measurements”: reword the sentence, please.

P. 3086: “A peak of mineral dust. . . ”, “The understanding of aerosols concentrations after emissions, transport and chemistry is very sensitive to their size distribution”: reword the sentences, please.

The introduction of the Section 2 (P. 3068) must be rewritten: the text contains multiple repetitions of ‘are used’. The same is observed in lines 22-25 of P. 3072. Section 8.2 contains multiple repetitions of ‘most important’ (P. 3085).

The word ‘aerosol’ is used in the text as plural noun, for instance, ‘aerosols optical depth’, ‘aerosols size distribution’, ‘aerosols composition’, etc. In my view, the form ‘aerosol’ is more preferable, common and readable.

P. 3066: line 27, I would replace ‘optical thicknesses’ to ‘optical depths’. As a whole, the phrase “optical thicknesses deduced from sunphotometers” is incorrect in the current context.

P. 3072: A misprint, probably: “. . . from 40 to 40 μm . . . ”.

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