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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source attribution and radiative impacts of the Mediterranean summertime ozone maximum: a satellite and model perspective" *by* N. A. D. Richards et al.

Anonymous Referee #2

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This manuscript uses observations and model results to attribute the tropospheric ozone maximum over the Mediterranean and quantify its radiative impact. The station and satellite measurements adequately establish the summer ozone peak in the region and are also used to evaluate ECMWF driven 2004-2008 simulation with the TOMCAT global chemistry transport model. The same model is run under various reduction scenarios for several emission sources to identify the contribution of the different sources. Local (Euro-Mediterranean) NOx and biogenic VOCs dominate in determining the lower tropospheric ozone maximum in the summer, while Asian emissions, global NOx and global biogenic VOCs are the main influence in the upper troposphere. The paper is well written, its methodology sound and the tools appropriate.

My only strong comment is on the lack (and need) to attempt to explain/discuss potential mechanisms and/or pathways that bring about the main results of the emission contributions. For example, what could be the reason of the prevailing effect on ozone of NOx among the various emissions? Or, why the global biogenic VOC effct is larger above 700 hPa?

For the meteorological contributions I would not worry so much because their effect (of whatever magnitude, see next sentence) is the same in the control and the reduction simulations. However, the meteorology role could be important (as the other reviewer points out) and, since this is not diagnosed in this study, I suggest to slightly modify the Title in order to clarify that only chemical emission sources are examined in this work.

Overall the paper work is a useful input to the topic of Mediterranean air pollution. I recommend publication to ACP once the following minor points are addressed.

Specific Comments

page 27222, lines 1-10: the description of the western Mediterranean ozone is qualitative, limited to the topographical causes of its formation and, in contrast to the eastern Mediterranean in the previous page, does not provide any quantitative information on the observed ozone levels. Please restore this imbalance if possible, by extracting actual values of tropospheric mix. ratio or partial column of summer ozone for western Mediterranean from the already cited papers (e.g. Velchev et al., 2011) or/and others (e.g. Ravetta et al., 2007).

page 27224, TOMCAT description: Please state if the model chemistry interacts with radiation and dynamics.

page 27224,TOMCAT description: is chemistry (e.g. in-plume destruction of NOx) from shipping emissions treated specially (like, for example, in Duncan et al. (2008)?

page 27226, Evaluation of TOMCAT using satellite observations: Why comparison with TES is done only for 2005? Can other years be included? The same for the

GOME-2. More years could give a better feeling for the degree of the observed inter-annual variability and the persistence of the summertime ozone maximum (and model capability to capture this).

page 27229, line 25: what's the geographical definition of east and west Mediterranean?

page 27234, line 3: separate "monthly" from "average" (currently appear as one word).

page 27247, Figure 1 caption: please insert here too the four station names to assist fast inspection and interpretation.

References

Ravetta, F., Ancellet, G., Colette, A., Schlager, H., May 2007. Long-range transport and tropospheric ozone variability in the western Mediterranean region during the intercontinental transport of ozone and precursors (ITOP-2004) campaign. Journal of Geophysical Research 112 (D10), D10S46+. URL http://dx.doi.org/10.1029/2006JD007724

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 27219, 2012.