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Atmospheric Chemistry and Physics Discussions

Interactive comment on "

The impact of temperature changes on summer time ozone and its' precursors in the Eastern Mediterranean" *by* U. Im et al.

Anonymous Referee #1

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General comments

This paper presents some interesting results, but the presentation (in terms of both the scientific content and the English) needs to be improved before it can be seriously considered for ACP. I think there may be a problem with Figure 4 (and possibly 5); there seems to be a difference between the text and these figures. The analysis of processes that contribute to changes in concentrations on the model grid (section 3.2) should clarify that the thickness of model layers has an influence on the vertical transport terms. I think this analysis should be rethought and rewritten with this in mind. The

vertical model levels and the PBL must be carefully defined. It is not clear how much of an influence this will have on the way the results are presented and interpreted, but I think this must be done before the paper is reassessed.

Specific comments

P4355

Title: its not its'

P4356

L14: Clarify you mean 1000m in the vertical, not horizontal.

L14: Delete 'rate'. It is just a response, not a response rate.

L17: As above: this is a sensitivity, not a rate.

L18: As above: 'change rate' – clarify.

L22-23: The opening sentence is awkward and should be reworded.

L24: Delete 'the formation of'.

P4357

L5: in THE presence of

L24-25: 'secondary pollutants like O3 are produced photochemically during transport of precursors from the surrounding regions:'. This wording suggests that surrounding regions are the (only/main) source of the secondary pollution, but there is significant secondary pollution produced downwind of the megacities within the region. Clarify.

P4358

L17: What is meant by 'mean maximum'? Do you mean daily maximum?

P4359

L16: The vertical and time resolution of the NCEP data should also be specified.

L19-20: The description of the vertical levels is unclear. Is the lowest level 0-8m?

L26: Is the nudging applied to every grid square every timestep? What is the relaxation timescale?

P4360

L8: in -> at

L10: in -> on

P4361

L6: is -> are

P4362

L18 Insert 'The' at the start

P4363

L6: Clarify 'j'. Is it the vertical level number?

L15: days -> day

L15: just say July 1-15

L23: I think the SI unit is K not °K

P4364

Clarify that anthropogenic VOC emissions are not temperature-dependent in your model. In reality, evaporative VOC emissions increase with temperature.

L24: on A daily basis

P4365

It would be useful to indicate the location of the sites on a map somewhere (incorporate into Figure 1?)

P4366

L28: I don't understand why the good agreement of modelled and observed temperatures 'suggests comparable isoprene concentrations on these days.'

P4367

L2-3: It would be helpful to indicate that by 'moderately' and 'much better' you mean r=0.4-0.5 and r=0.8-0.9.

L5: From Figure 4a I am surprised that IST shows r=0.9. Is this correct?

L7: The overestimate of 47.9% at FIN also seems at odds with Fig. 4e. Are Fig. 4 (a) and (e) mixed up?

L18: Close inspection of Fig. 5a indicates a value for Athens of about 50 ppb, not 35 ppb?

L25: Is the contribution of 20 ppb towards O3 or NOx?

L27: Are NMVOC and VOC different? If not, just use one acronym. If they differ, explain in what way.

P4368

L13: I went away and located Finokalia for myself, and was interested to find it on Crete. As indicated earlier, a location map should be included.

L13: What is meant by 'regional influence'? Do you mean that this station is influenced by a larger region than the others? How is this measured?

P4369

L4: By 'surface O3' presumably you mean O3 in the lowermost model layer?

L7-8: i.e. O3 is exported horizontally from the domain in the PBL.

L9 onwards: Isn't it inevitable that a thin, wide, surface layer will be dominated by VTRA and DDEP? The thickness (or thinness) of the layer is highly relevant. E.g., consider an infinitesimally thin layer – this will clearly be dominated by vertical transport processes.

L27: 'The impact of VTRA is particularly remarkable at the surface'. I don't think it is, it is at least partly because the surface layer is so thin. This must also be a significant factor in why VTRA is much more important when just considering the surface layer as compared to the whole PBL.

How is the PBL defined? It seems surprising that 27 of the 30 model layers are always in the PBL at all sites over the 15 days. Doesn't the PBL vary in height with time and location? Are there really only 3 layers in the free troposphere of the model?

P4370

L2: Figure 6 doesn't indicate height, so it is difficult to know where the first 1000m above the surface is. Height should be added to Figure 6.

L28: 'In Istanbul (Fig. 7a), the air parcels move upward until around 850 mbar.' Looking at the arrows directly above IST in Fig. 7a, this doesn't seem to be the case?

P4371

L21: A similar pattern

P4372

L8: result in domain wide

P4373

L4: O -> On

L9: levels -> distribution

L16: 'increased' relative to what?

L20: extend -> extent

L21: Are the first results in Fig.11 averaged over the entire model domain?

P4374

L2: The contribution

P4376

L1: Reword 'results point that'

P4385

Are the data for surface daily means?

P4388

Fig. 1 caption should explain the A-A' and B-B' lines. Suggest add locations. For (b), the units on the graph axis and in the caption differ.

P4390

Fig. 3 caption: Daily mean not 'daily total'?

P4391

Fig. 4: See above – are panels (a) and (e) mixed up?

P4396

Fig. 9 caption should state (c) to (h) are for the surface layer.

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