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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of climate change on photochemical air pollution in southern California" *by* D. E. Millstein and R. A. Harley

Anonymous Referee #3

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General Comments This manuscript presents a valuable analysis of the response of ground level ozone in Southern California to a number of variables than can be expected the change in the future. The authors have examined the response of ozone air quality to changes in emissions of ozone precursors and climate variables individually, separately aggregated into climate and anthropogenic evaluations, and with all predicted future changes implemented together. I support its publication after the authors address the comments below. The changes predicted in emission factors are dramatic so it would be useful to know after population and activity changes are taken into account, what values are used for the overall change in regional anthropogenic emissions. In any event, these changes are unlikely to occur as step changes in the real world. Because the response of ozone is nonlinear with respect to changes in

local emissions (i.e. the response after 20% reductions will not be half of what it is after 40% reductions), it would be interesting to know if the same direction of change in ozone is predicted for more modest emission decreases. For example, Figure 4b shows that throughout most of the domain, peak ozone decreases in response to regional anthropogenic emission reductions, but this may not be the case for other levels of reductions.

Specific Comments

P1564, L4-5, would irrigation also increase atmospheric humidity and impact O3?

P1567, L3, is the future emission scenario business as usual for CO2 only? This is ambiguous as you have just stated that emission factors for other anthropogenic gases have been reduced by 80%.

P1567, L6-15, the discussion of future boundary conditions is confusing. Are you saying that a global model using the A1B scenario predicted increases of 30% in methane, 40% in CO, and 15% in ozone over the eastern Pacific? And that you chose to increase the ozone by 30% instead? Given that many models have predicted decreased ozone concentrations due to higher absolute humidity in remote locations, what is the rationale for increasing inflow ozone so dramatically?

P1568, L15, does the SPRC99 mechanism include the reaction of biogenic VOC with ozone? One might expect a substantial increase in the chemical loss rate of ozone when biogenic VOC increase in some parts of the model domain if this is the case, especially in Sup Fig 5

P1568, L22, from Sup Fig 2, it looks like the response to increased water is actually negative in most of the domain

P1573, L6-8, is it the import of additional precursors, or of ozone itself that contributed most dramatically to increased ozone in coastal areas?

Supplemental Figure 3 gives the impression of substantially larger ozone concentra-

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tions, but the main increases occur at night and likely result from the drastic reduction in NOx emissions. Given that the model struggles to partition Ox appropriately at night at many sites, e.g. Anaheim, Pomona (Supp Fig 1), is this result really robust?

Supplemental Fig 4 - why choose to change only temperature for this comparison? Since the changes are relatively modest, it would be helpful to scale the axes between +/- 10 ppb so the changes are easier to see.

If the minimal increase in daytime temperatures is resulting from irrigation, and presumably higher latent heat flux, wouldnt this also be associated with an INCREASE in relative and absolute humidity during the day? Should this also be included?

Technical Comments

P1562 L21-23, this sentence does not make sense

P1570, L8, sentence about figure 4d has already been stated above

It would perhaps be useful to keep markers of the positions of Central LA, Riverside etc on Fig 2 and 3 to orient the reader as you do in Fig 4.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 1561, 2009.

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