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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Exposure-plant response of ambient ozone over the tropical Indian region" *by* S. Roy et al.

Anonymous Referee #1

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Roy et al. use a regional, off-line, chemical transport model (REMO-CTM), partly fed with emission data from a new Indian emission inventory to create ozone fields over India for the year 2003. The current paper is short and concise and complement the work by the same authors recently published in JGR (doi: 10.1029/2007JD009712). The paper focus on AOT40, which was not discussed in the first paper. In the present paper the authors rightly point out that measurements of AOT40 (or other ozone-related measures related to crop-damages) are extremely scarce in the region, and that verified models can be used to estimate regions at risk. The authors also rightly argue that correct and updated emissions inventories are most important for the modelling activities to become successful.

Specific Comments

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Interactive Discussion

Discussion Paper

Although there is additional evaluation of the REMO-CTM system in the complementary JGR-paper, the reader can not really assess the ability of the modelling system to correctly describe AOT40 across India. The only control of the system's ability to calculate surface AOT40 is given by the comparison with the data collected at a suburban site in Pune. The lack of relevant measurements over the Indo-Gangetic plains is a severe drawback in this and similar modelling studies. The authors should, nevertheless, explore additional ways to evaluate the performance of the model. Optimally, of course, by comparing with real-world AOT40 data collected at rural location across India during 2003. Other methods include comparing other ozone measures, which may be more readily available or AOT40 generated by other models operated over India. Two such studies are already mentioned in the paper.

The quality and accuracy of the emissions inventory utilised for the present study is also difficult to asses. There is no information given about the temporal or vertical spread of the emissions in the model domain. There is no information on how biogenic isoprene emissions are treated. Again a comparison of the present emission inventory with other, recent, emission inventories generated for India would be helpful for the reader to assess the uncertainty in previous and present emission inventories for India.

Give co-ordinates of the site in Pune where the ozone measurements were collected. Discuss the surroundings of the monitoring station, being a >suburban station< (p. 4149, l. 6-7) located within the bounds of a city with more than 5 million inhabitants. How well is such a station suited for verifying a regional model operating across India.

The maps of Fig. 3 show AOT40 accumulated during one month only. Personally I would much rather have seen 3-month AOT40, for which there are (at least for Europe) established dose-response relationships for crops. If 1-months maps are retained, the reason for not forming (the traditional) 3- or 6- month AOT40 needs to be clarified in the text. Also, there are three panels but two different colour-legends. It is impossible to judge which legend that goes with which figure(s). Please use one legend for all three panels.

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On page 4147 and 4148 reduced solar radiation following the cloudy conditions during the rainy season is mentioned several times as one of the main reasons for the lower concentration of O3 during this period. Is there really any evidence for this statement? How do we know it is not caused by reduced precursor concentrations or different circulation or mixing patterns?

On page 4148, lines 16-21 a number of -emission sources scattered over the entire IG region-. Shall one interpret this as these sources not occurring elsewhere or that they occur in far higher numbers here?

Although it is never claimed that the model covers the whole country of India it appears from the maps presented that the whole nation is not included (a number of north easterly states seem to be omitted), is that a correct observation?

Technical corrections

p. 4142, l 16: -November and April- should probably read -November to April-

p. 4143, l. 27-28: Engardt (2008) use an Asian (not global) emission inventory (TRACE-P, Streets et al. 2003, doi: 10.1029/2002JD003093).

p. 4144, l. 1-2: Dalvi et al., 2006 and Beig and Brasseur, 2006 are both missing in the reference list.

p. 4144, l. 19: -0 to 10 hpa-. Should probably be -0 m to 10 hPa-, or -surface to 10 hPa-.

p. 4145, l. 26-27: -we present daily AOT40 values, daily 8 h average and the daily maximum ozone levels over the Indian region-. Actually these values are only presented for the model grid-cell encompassing Pune.

p. 4146, l 12-13: -between November 2003 and May- never really happens. Id recommend formulating it as -during Jan-May 2003 and Nov-Dec 2003- or skip the year and write -between November and May-;

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Interactive Comment

p. 4148, l 1: -monsoon season- Maybe better to spell out the months in question. Some authors have defined Summer- and Winter- (or South-West, North-East) Monsoon. Also the period is not unambiguously defined across all India.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 4141, 2009.

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