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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone and carbon monoxide over India during the summer monsoon: regional emissions and transport" *by* N. Ojha et al.

Anonymous Referee #1

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This paper highlights the need for more aircraft-based measurements over India and adjacent regions and the improvement of emission inventories. Comparison of Ozone and carbon monoxide profiles from the CARIBIC aircraft with WRF-Chem simulations show that long-range transport of CO to southern India is significantly underestimated in WRF-Chem.

I agree with authors that there is need of aircraft measurements over Asian summer monsoon region and the improvement of emission inventories. However this paper has neither tested the performance of different anthropogenic emission inventories over the Indian region nor explored in detail the transport of CO or ozone during the monsoon season. I suggest major revision of this manuscript.

It is not clear why authors chose regional model (WRF-Chem) and not GCM to analyze long range transport due to monsoon convection. If the objective of the paper is to show the WRF-Chem model performance and need for improvement of the emission inventory then model performance should have been tested during clam winter condition. WRF-Chem Model may perform better during winter season however, being a regional model it may not simulate the monsoon related long range transport as good as GCMs.

The authors have shown that WRF simulations show good agreement with MOPITT during subdued convection time in June while biases are large during July and August when monsoon convection is very strong. This may be related to lateral forcing which is not the case in GCMs.

I suggest adding results from few more simulations from latest regional emission inventories (for example Amnuaylojaroen et al., 2014) before arriving to conclusions.

The ozonesonde (http://woudc.org/) and CAIPEEX aircraft data (CO and O3 – http://www.tropmet.res.in/∼caipeex/about-data.php) is available over the Indian region during monsoon season. Authors should compare WRF-Chem simulations with these data sets.

Section 4.3 – This section is weak. I suggest adding figure showing the monsoon convection play an important role in lifting of boundary layer pollutants (from Indo-Gangetic plane or Bay of Bengal) into the monsoon anticyclone (see Randel et al., 2010; Park et al 2007; 2009; Fadnavis et al 2013, 2014). The effect of enhanced CO emissions (50%) on transport into the upper troposphere and lower stratosphere can be discussed in detail. I suggest adding a figure of lat-long sections in the UTLS and related discussions.

Section 4.3.1 – Authors have not mentioned the location of strong pollution event on 15 July 2008 and the reason for this. It is quite obvious that model will underestimate such event as emission inventory does not account it. One can assimilate satellite data

and reproduce such event.

Conclusion section – It should be revised thoroughly. I suggest authors to mention the outstanding results from this study.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 21133, 2015.