**Atmospheric
Chemistry
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Discussions**

Interactive
Comment

Interactive comment on "The Bihar Pollution Pool as observed from MOPITT (version 4), CALIPSO (version 3) and tropospheric ozone residual data" *by* J. Kar et al.

Anonymous Referee #2

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General Comments: This paper presents a multi-sensor assessment of tropospheric pollution over the Indo-Gangetic Plains (IGP) based on spaceborne observations of Carbon Monoxide, tropospheric ozone and aerosol loading. The IGP is a densely populated region fraught with high levels of anthropogenic pollution as well as is significantly influenced by seasonal biomass burning and dust storms that impacts the regional atmospheric chemistry and aerosol optical properties. The paper combines measurements from different satellite-based sensors and focuses on the heavy anthropogenic pollution over the eastern IGP during winter-time. The paper is generally well-written and the observations are portrayed in a clear and convincing manner. There are some revisions and comments that should be incorporated before the manuscript

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can be accepted for publication.

Comment related to the Title: Current title of the paper is "The Bihar Pollution Pool as observed from MOPITT (version 4), CALIPSO (version 3) and tropospheric ozone residual data"

Authors indicate that the pollution pool extends over the eastern parts of IGP including Bihar, West Bengal and Bangladesh and is attributed to strong localized subsidence and relatively calm winds and a stable atmosphere. In that case, why should the pollution pool be referred to as the Bihar Pollution Pool (BPP)? In fact the BPP is not a permanent feature as the distribution of pollution (including aerosols and trace gases) is quite different over the summer and pre-monsoon seasons (see Gautam et al., 2009, 2010) compared to the winter season. As shown in majority of the figures, for example in the tropospheric Ozone and aerosol loading plots, the high pollution region is not just specific to the state of Bihar. Figure #13 clearly shows maximum AOD around Kanpur during December 2006 and over Bangladesh during December 2009, with both regions outside the BPP.

The pattern of heavy pollution during winter-time being reported in this paper is therefore not specific to the Bihar region but is generally true for the eastern Indo-Gangetic Plains. Thus, the phrase "Bihar Pollution Pool" should be dropped from the title and "Eastern Indo-Gangetic Plains" AND "Winter" should be added to the title in order to correctly reflect the findings of the paper.

I also suggest dropping the version information from the title as it is too specific for a title. Instead, version information should be given in the Abstract, Data details and Conclusions sections and wherever applicable.

Specific Comments: - Fig. 1: Why is there significantly fewer profiles over the central IGP region (80.5 E) compared to the eastern IGP (84.5 E). Is it due to the higher fog cover in the western-central IGP compared to the eastern plains, therefore suggesting the sample drop in retrievals? I would think that the western IGP would experience

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significantly higher foggy conditions as the winter-time cold waves enter into the IGP from west-northwest and the airmass moves towards eastward. The surface temperatures also vary from west to east with the western IGP generally characterized by lower temperatures.

- Since the paper focuses on pollution over the Eastern IGP, authors should briefly discuss the meteorological background during winter-time over the IGP. They can refer to published literature and explain briefly the regional meteorology in relation to the pollution dynamics. The inter-annual variability discussion also needs to be bit expanded and mentioned in the manuscript that the high AOD region (as observed from MODIS) and the magnitude varies significantly depending on the prevailing meteorology (Gautam et al., 2007).

- Figure #5 is quite interesting. Some information about sample size would be useful.

- Characterization of layer top altitude (Figure #7). Caption says - December 2006-February 2007. However, plots for other three seasons are also shown. Figure caption and related text should be corrected.

- Seasonal variations of aerosol types is shown in Fig. 8. Intra-seasonal variability of dust loading is captured well in the CALIPSO data. Authors should refer to previous studies of dust-loading observations (Gautam et al., 2009, 2010) and briefly discuss the transport pathways.

- The text relevant to Figure 10 (layer top altitude as a function of optical depth) is too short. This can be expanded a bit or combined with other sections on aerosol loading.

- Correction to be made in the Acknowledgments section, the AERONET station at Kanpur was established by Brent Holben and Ramesh Singh in 2001. RS was the PI from 2001 till 2007 and can be seen from the AERONET Kanpur webpage. The Acknowledgments pertaining to AERONET data should therefore be rectified.

References: Gautam, R., Z. Liu, R. P. Singh, and N. C. Hsu (2009), Two contrasting

dust-dominant periods over India observed from MODIS and CALIPSO data, Geophys. Res. Lett., 36, L06813, doi:10.1029/2008GL036967.

Gautam, R., N. C. Hsu, and K.-M. Lau (2010), Premonsoon aerosol characterization and radiative effects over the Indo-Gangetic Plains: Implications for regional climate warming, J. Geophys. Res., 115, D17208, doi:10.1029/2010JD013819.

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