

Interactive comment on “Air-borne in-situ measurements of aerosol size distributions and BC across the IGP during SWAAMI” by Mukunda Madhab Gogoi et al.

Binita Pathak

pathak.binita8@gmail.com

Received and published: 22 April 2020

General comments

Air-borne in-situ measurement of aerosol size distributions and BC across the IGP during SWAAMI

By Gogoi et al.

The paper presents the results of the aircraft in situ measurements carried out at three selected locations in the Indo Gangetic plains (IGP) in the summer of 2016 before the advent of the South West Asian Monsoon to obtain the vertical distribution of compos-

C1

ite aerosols and Black Carbon (BC). The aim of the experiment was to distinguish the characteristics of aerosols in the vertical column from surface to peak aircraft altitude. The location and timing of the experiment was so conceived that it covers the west east cross section of the IGP from the semi-arid desert in the west, the central IGP characterized by significant anthropogenic activity and the east coast location influenced by the marine environment and industrial activity. Some other aspects investigated during the SWAAMI are already in the public domain. The well-planned experiment reveals that in-spite of the known east west heterogeneity in aerosol characteristics in the IGP as unveiled from ground based observations, the coarse mode concentration and coarse mode mass fraction of aerosols representing mainly soil dust increases with increase in altitude across the IGP especially above the well mixed layer. Hence, the mode radii and geometric mean radii of aerosol particles increase with height. The east west heterogeneity is mainly restricted to within the boundary layer e.g. the highest coarse mode mass fraction (of the total aerosol load) is seen in the western IGP and highest accumulation mode mass fraction in the central IGP. The high concentration of coarse mode fraction is attributed to mineral dust loading. Simultaneous International Space Station overpass measurement reveals that dust aerosols reach altitude as high as 5 km in this season. On the contrary, BC mass concentration show very little altitude variation upto the aircraft top height. The results so obtained are new, and significant from the point of view of aerosol-radiation interaction and aerosol-cloud interaction. It also establishes unequivocally for the first time the heterogeneity between aerosols within the ABL and free troposphere in the IGP.

In view of the above, I strongly believe that the paper qualifies for publication in the prestigious journal ACP. I recommend publication of the article with minor revisions.

Minor comments/suggestions

1. Though the paper is well written I would suggest a thorough editing of the text by the authors for more clarity at some points and inadvertent grammatical mistakes or overwrite. Also, chronology in references inside the text should be maintained throughout

C2

the text. 2. How the hygroscopic growth under extremely humid conditions as in case of BBS are taken care of in the APS measurement, please specify in the relevant text. 3. The main concern regarding a few figures and their captions as given below. a. Figure 1: Caption please rewrite. It is the AOD 500 nm which is shown in the surface plot upon which the stations are marked. In the figure, the triangles may be identified with the abbreviated station names for better visibility. Authors may rethink about Figure 1, as not much discussion on it is found in the text. Figure 2 is sufficient to represent the site description with the base stations. Otherwise, a few lines on AOD distribution may be added in the text based on Figure 1. b. Rewrite the figure caption 4. c. Figure 5: Replace ... 'eastern part of India by '.....eastern part of IGP'. d. Figure 8, Caption please delete 'distinct': also replace 200 by 2000 e. Figure 11b replace MBC by FBC, perhaps there is some confusion with Fig. S2. f. Figure 12. Please zoom in the areas between the ellipse for clarity of the aircraft tracks. Also interchange b & c in the caption. g. Figure 15 What is indicated by the vertical dashed line? Please mention in the caption. 4. In continuation to comment 1, following are a few suggestions in the text. a. Line 90: correct "...various aerosol properties" as "...various aerosol parameters". b. Line 93: modify as ...(Bhubaneswar (BBR),the industrialized coastal location in the eastern end of the IGP. c. Line 90-95 can be merged with Line no 111-120 and figure 1 can be shifted to this section. d. Line: 96-99: Please rewrite the sentence e. Line 103-110: can be placed at the end of this section or can be shifted to section 2.2 f. Line 138-146: Should be rewritten and placed at Line 131. g. Section 2.4 should be merged with section 2.2 or put before section 2.3. h. Line 287-292: See if these sentences are more appropriate to place in previous paragraph (after Line 271) i. Line 349: '.....organic carbon being strong absorbers of UV radiation', please check. j. Line 503: Rewrite the sub-section heading

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-144>, 2020.