

Black colour is used for Referee/Editor statements. Blue colour is used for our response. Maroon colour is used to quote text added to or already present in the manuscript.

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We thank both referees and the handling editor for their careful reading of the revised manuscript and for confirming that only minor points remain. We address each point below and indicate exactly where the manuscript text was changed. Line numbers refer to the revised manuscript with all changes accepted.

Referee 1 (Report #2, submitted 11 Sep 2026)

Comment: *The current title, "Frequent new particle formation events in the Indo-Gangetic Plain occur under reduced condensation sink but are obscured by air mass heterogeneity" is not the correct title for this manuscript.*

- *The frequent NPF is based on the 108-day NAIS classification, which peaks in May/June.*
- *'Reduced condensation sink' refers to the NAIS + SMPS dataset, which is 24 days between August and November.*
- *The term "obsured by air mass heterogeneity" is not really delivered by the manuscript. Really what the paper shows is local variability in wind direction. This is also based off a small case study.*

So, there are analyses on three distinct periods. I think a descriptive title would do this manuscript more justice than the current one that implies a mechanistic study. I'd emphasise that this is not to the manuscripts detriment, but would make it more clear what it actually contains.

Response:

After some more internal discussion and reflection among the authors, we have changed our consensus and agree with the reviewer that it would be appropriate to change the title (for the reasons nicely summarized by the reviewer). We have now updated the title to a descriptive one.

Updated title: "Ion and particle size distribution measurements in the Indo-Gangetic Plain: Seasonal insights and challenges in new particle formation event characterization".

Referee 2 (Report #1)

We thank the referee for the positive general assessment and for the two remaining points below.

Comment 1

Comment: *While I commend the authors for clearly stating the NAIS and SMPS data coverage and acknowledging the limited simultaneous measurements, the consequences of these limitations are not yet fully discussed in the text. As Referee 1 astutely noted: “My view is that being upfront about those limitations would make this a stronger paper, not a weaker one. I’d encourage the authors to lean into that rather than away from it.” While the issue of pollution contamination has been well addressed, the implications of the data coverage still need a bit more explicit contextualization. In their rebuttal to Referee 1, the authors state: “**Therefore, the CS results are presented as limited concurrent data analysis, not as a seasonal or campaign-wide average.**” Similarly, in response to Referee 2, they note about J: “**Only three event days satisfied all these requirements, and these are therefore presented as case-study estimates rather than seasonal or campaign-wide averages.**” These important framing sentences do not currently appear in the revised manuscript. Integrating these statements (or similar phrasing) directly into the main text would greatly help readers appropriately contextualize this portion of the data analysis.*

Response: Agreed. We have added both framing statements directly into the main text (Sect. 2.3 and Sect. 3.2.2), at the point where each restricted subset is introduced, rather than only in the rebuttal letter.

Text revised in the manuscript (Sect. 3.2.2, p. 21–22, lines 617–620): “...compared with 0.0292 s^{-1} (IQR: $0.0171\text{--}0.0413 \text{ s}^{-1}$; $n = 15$) on non-event days. This difference is statistically significant (exact two-sided Mann–Whitney U test on the 24 independent daily medians, $U = 21$, $p = 0.00435$; rank-biserial $r \approx 0.69$). Because this comparison is restricted to the concurrent-instrument subset, the CS results are presented as a limited concurrent-data analysis rather than a seasonal or campaign-wide average.”

Text revised in the manuscript (Sect. 2.3, p. 9, line 325): “...so CoagS and J were calculated from the merged NAIS+SMPS PNSD rather than from a truncated NAIS-only distribution. These values are therefore presented as case-study estimates rather than seasonal or campaign-wide averages.”

Comment 2

Comment: *“I noticed that the statement regarding the statistical significance of the CS reduction on event days was removed in the revision (specifically, the sentence noting a Mann-Whitney U test, $p < 10^{-17}$)... An extremely low p-value on the order of 10^{-17} makes me wonder if the test might have been run on the 5-minute windows rather than the 24 independent daily medians... I invite the authors to clarify how this statistic was calculated and encourage them to reinstate the significance metric, provided the test is executed on the independent daily medians.”*

Response: The referee’s comment is on point. The previously reported extremely small p-value ($p < 10^{-17}$) was due to treating the 5-minute observations as independent samples, thereby inflating the effective sample size. Because observations within the same day are not statistically independent, we removed that result during the previous revision, but the significance

statement was not reinstated on the corrected subset. We should have included the edit in the revision, but it was inadvertently left out.

We have now re-run the Mann–Whitney U test using the 24 independent daily median CS values (9 event days, 15 non-event days, 06:00–12:00 LT, August–November) underlying Fig. 9, giving $U = 21$ in either case. As there are no tied values and the sample is small, we report the exact (permutation) two-sided p-value, $p = 0.00435$, which we consider the more appropriate figure here rather than the normal/asymptotic approximation ($p = 0.0061$ for the same U); both are well below the conventional 0.05 threshold and lead to the same conclusion. The rank-biserial effect size is $r \approx 0.69$ (method-independent), consistent with the previously reported effect size (0.71). We have reinstated the exact test result in the main text, with the test type, sample sizes, and effect size all stated explicitly.

Text revised in the manuscript (Sect. 3.2.2, p. 21–22, lines 617–620): “...compared with 0.0292 s^{-1} (IQR: $0.0171\text{--}0.0413 \text{ s}^{-1}$; $n = 15$) on non-event days. This difference is statistically significant (exact two-sided Mann–Whitney U test on the 24 independent daily medians, $U = 21$, $p = 0.00435$; rank-biserial $r \approx 0.69$).”

Additional change

Dedication to Prof. Krishna AchutaRao. During the preparation of this revision, our colleague and friend Prof. Krishna AchutaRao, Professor at the Centre for Atmospheric Sciences at IIT Delhi, sadly passed away following a prolonged illness. Prof. AchutaRao's vision and leadership were instrumental in establishing the CAS atmospheric observatory at Sonipat and the CAS–INAR collaboration that made the measurements in this study possible. Given Prof. AchutaRao's contributions, we would like to dedicate the paper to his memory. So, we have accordingly updated the Acknowledgements.

Revised acknowledgement: “We dedicate this article to the memory of Prof. Krishna AchutaRao, whose vision and leadership were instrumental in establishing the atmospheric observatory at Sonipat and enabling the CAS–INAR collaboration that made this work possible.

We would also like to sincerely acknowledge Prof. Somnath Baidya Roy and other members of the CAS and IIT Delhi community for their contributions and active involvement in the planning and administrative efforts that led to the establishment of the atmospheric observatory at IIT Delhi. We are also grateful to the senior administration of IIT Delhi for their continued support in building and sustaining this important scientific infrastructure. Special thanks to the Institute for Atmospheric and Earth System Research (INAR), University of Helsinki, for their collaboration and support in facilitating this research, particularly through the provision of instrumentation, technical guidance, and associated infrastructure that made key observations and analyses possible. ChatGPT (OpenAI) was used to assist with grammar, sentence structure, and language clarity during manuscript preparation. All scientific content, analysis, and interpretation were developed by the authors.”