



Supplement of

Chloride (HCl / Cl⁻) dominates inorganic aerosol formation from ammonia in the Indo-Gangetic Plain during winter: modeling and comparison with observations

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The average diurnal profile of NO_x from the nearby CPCB site (RK Puram station) is displayed in Fig. S1 in the Supplement. A similar variation for NO_x was also observed by Chate et al. (2014) and Ghude et al. (2008a) over Delhi in the previous studies. It can be seen that NO_x concentrations increase in the morning till 09:00 h, followed by a sharp decrease in the afternoon, and reach maximum concentrations in the evening around 17:00-19:00 h. Morning and evening peak coincides with the rush hour of traffic flow during the peak hour. However, it is evident that the observed morning peak of NH₃ was not concurring with corresponding NO_x peaks, suggesting that traffic emissions do not contribute significantly to the observed NH₃ rise.

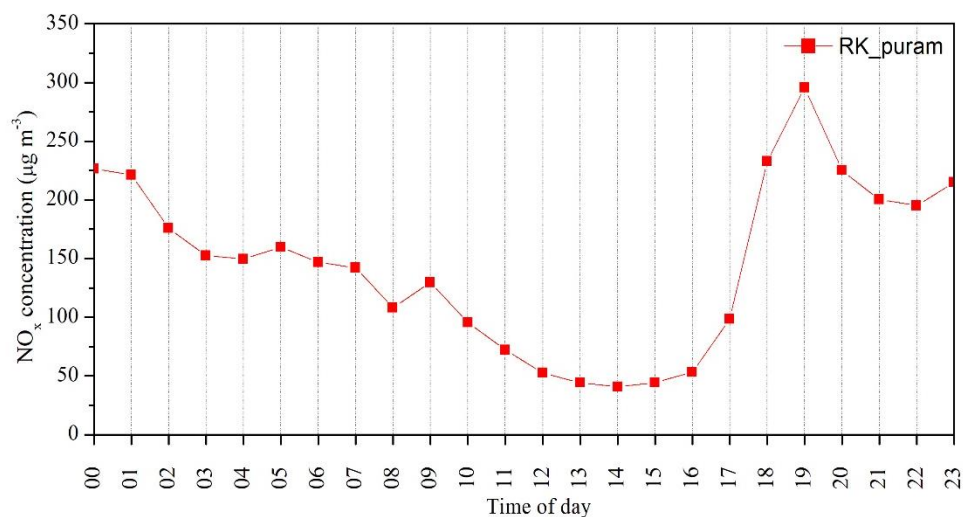


Figure S1. Diurnal variation of NO_x concentration from the nearest CPCB observation station

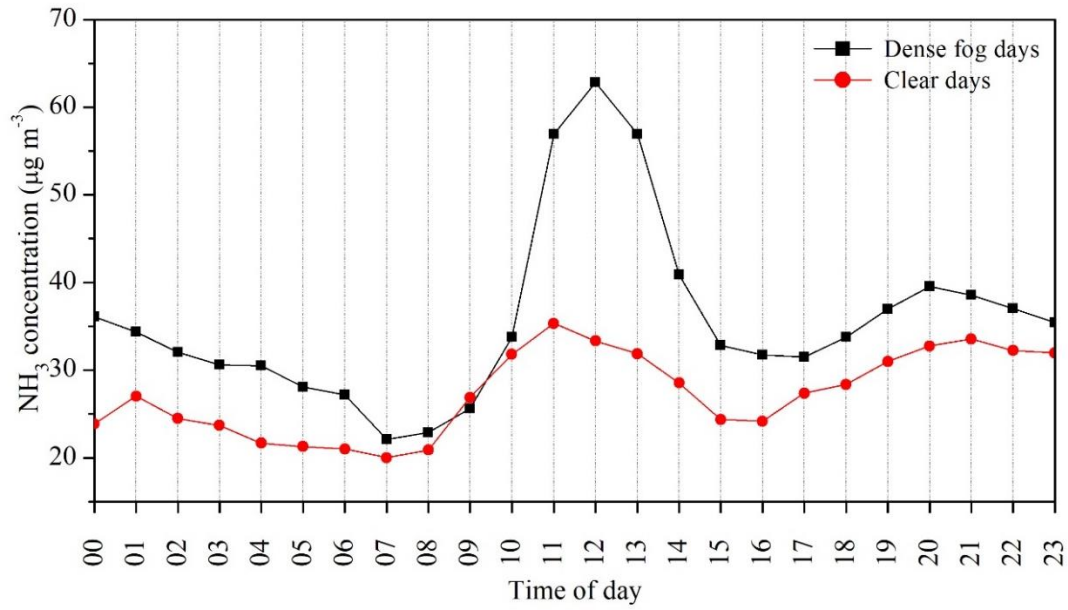


Figure S2. Average diurnal variation of NH₃ concentration during dense fog and

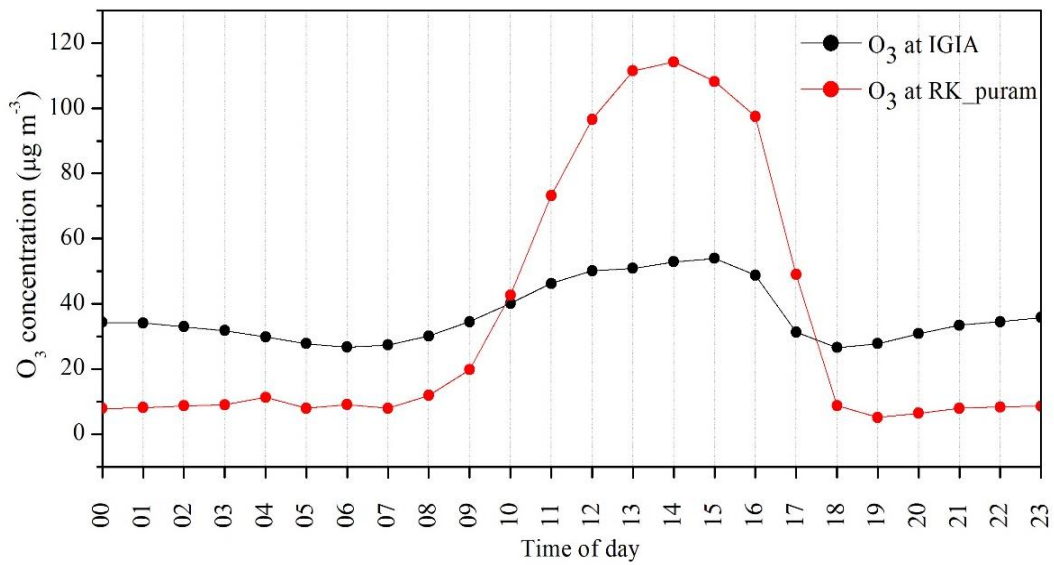


Figure S3. Average diurnal variation of O₃ concentration from the nearest CPCB observation station

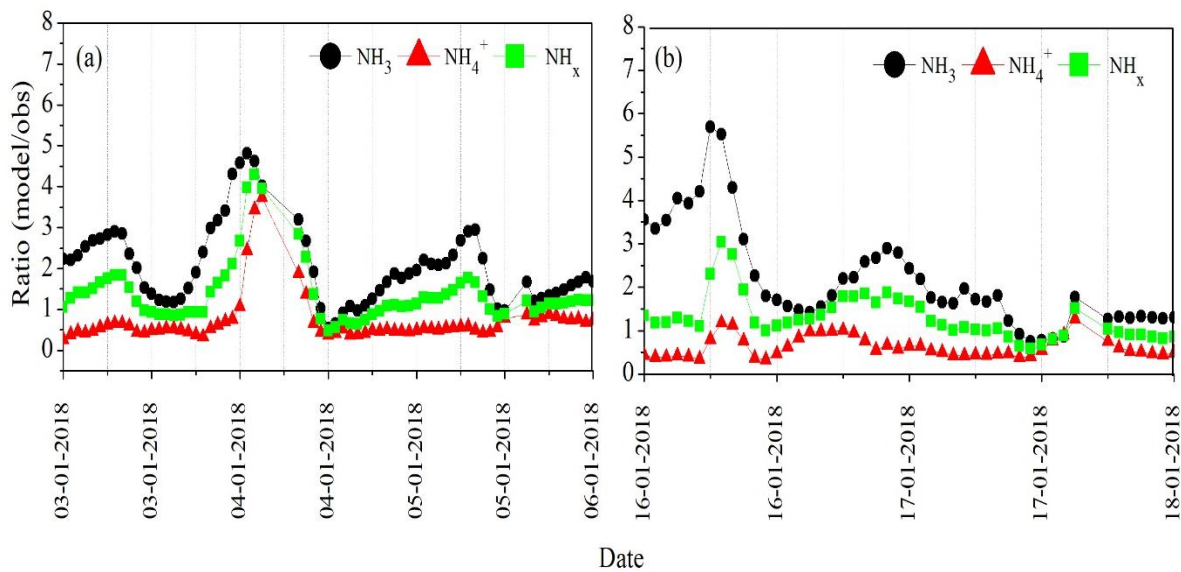


Figure S4. Ratio of model/obs for NH_3 , NH_4^+ and NH_x during (a) 03-06 January 2018 and (b) 16-17 January 2018

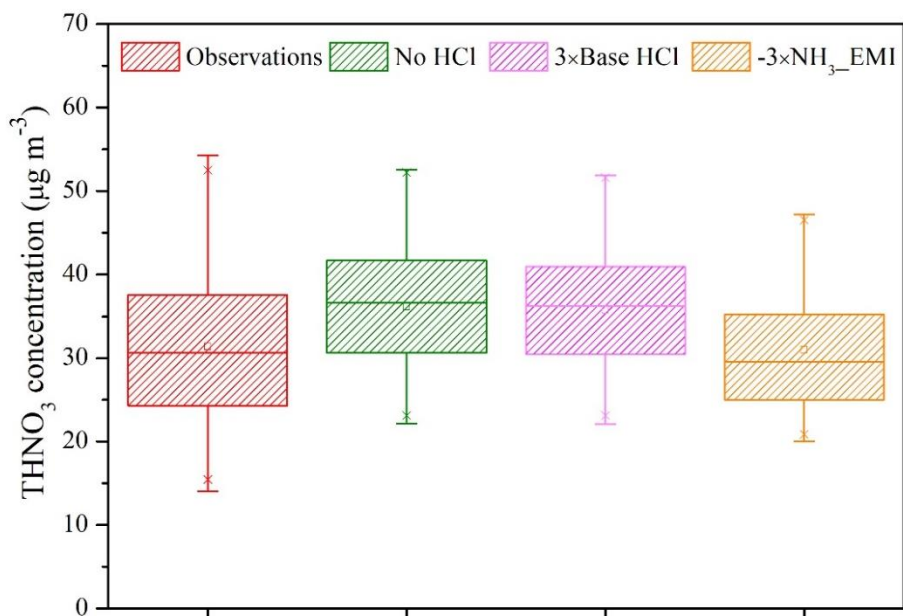


Figure S5. Box-Whiskers plot for THNO_3 ($\text{HNO}_3 + \text{NO}_3^-$) concentration from observations (red) and simulated by the No HCl (green), 3×Base HCl (pink) and -3× NH_3 _EMI (orange) at IGIA, Delhi.

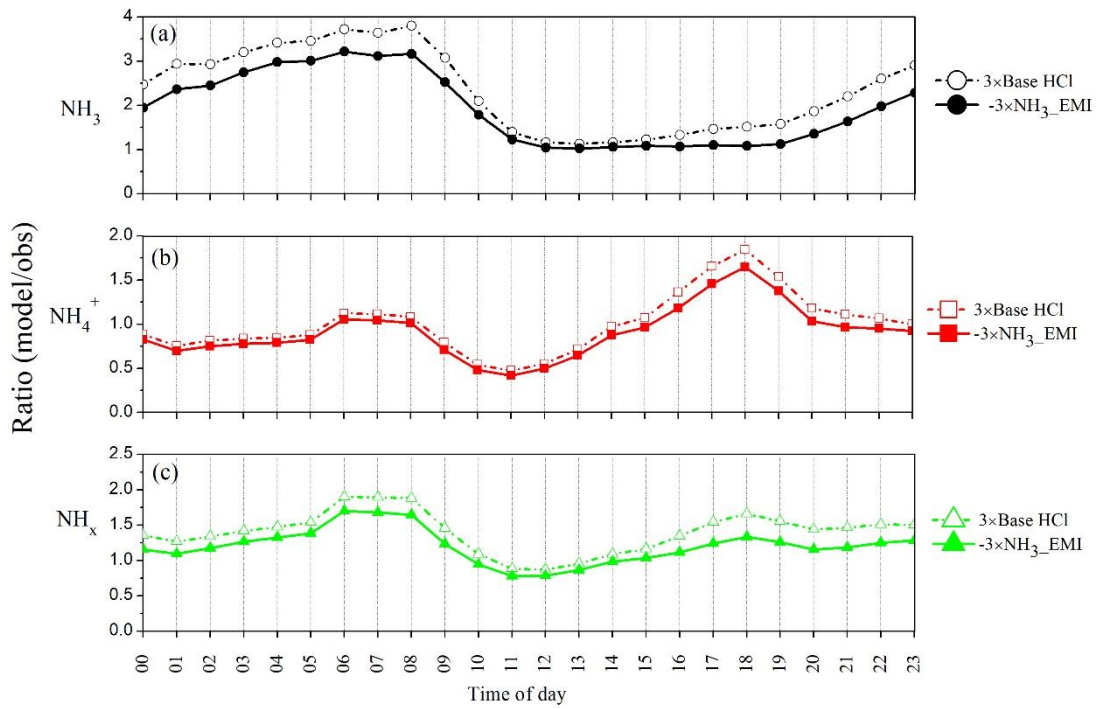


Figure S6. Comparison of diel profile of model/obs ratio for the mean (a) NH_3 concentration (b) NH_4^+ concentration, and (c) total NH_x concentration in 3xBase HCl and -3xNH₃_EMI scenario.

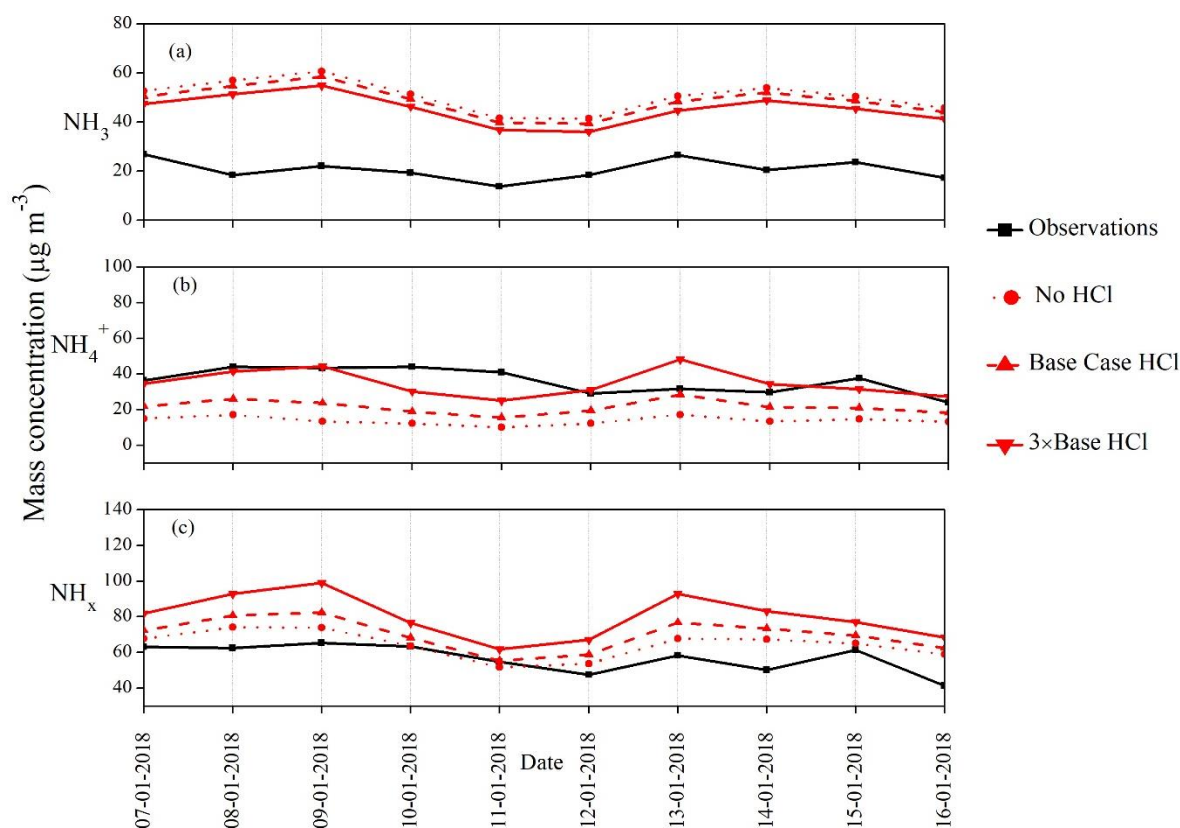


Figure S7. Temporal variation in the daily mean (a) NH_3 concentration (b) NH_4^+ concentration and (c) total NH_x concentration for measurements (black), No HCl (red dotted), Base Case HCl (red dash) and 3×Base HCl run (red solid).

References

Chate, D., Ghude, S., Beig, G., Mahajan, A., Jena, C., Reka, S., Dahiya, A. and Kumar, N.: Deviations from the O_3 – NO – NO_2 photo-stationary state in Delhi, India, *Atmos. Environ.*, 96, 353–358, doi:10.1016/j.atmosenv.2014.07.054, 2014.

Ghude, S. D., Fadnavis, S., Beig, G., Polade, S. D. and van der A, R. J.: Detection of surface emission hot spots, trends, and seasonal cycle from satellite-retrieved NO_2 over India, *J. Geophys. Res.*, 113(D20), D20305, doi:10.1029/2007JD009615, 2008.