Abundance and distribution of nitrogen dioxide (NO2) and particulate nitrate (*p*NO3−) at an urban site of Delhi-NCR

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The unprecedentedly increasing fuel combustion to fulfil the ever-increasing human population's energy demand changing the atmospheric composition, especially in terms of NO_2 and its transformational product (pNO_3^-), which exhibit a multitude of implications for the earth system and human health. The present study reports abundance and distribution of NO_2 and pNO_3^- at an urban site of one of the world's most populated and polluted region (Delhi-NCR). The samples were collected from October 2017 to September 2018 at an urban site of Delhi-NCR. The annual mean (± standard error) concentrations of NO_2 and pNO_3^- were observed to be 44.56 ± 3.19 μg m^{-3} and 10.86 ± 1.61μg m^{-3} respectively. Further, the NO_2 concentrations exhibited the transgression of National Ambient Air Quality Standards (NAAQRS) for NO_2, which is set to be 40 μg m^{-3} for urban areas. The day/night (D/N) ratios of both NO_2 and pNO_3^- concentrations were less than unity; therefore, they showed a good congruence with the atmospheric boundary layer's diel dynamics. The seasonal mean concentrations of NO_2 were observed as post-monsoon (77.84 ± 3.56 μg m^{-3}) > winter (39.79 ± 2.22 μg m^{-3}) > pre-monsoon (26.78 ± 2.44 μg m^{-3}) > monsoon (26.54 ± 1.33 μg m^{-3}). Similarly, the seasonal mean concentrations of pNO_3^- were observed as post-monsoon (19.20 ± 4.36 μg m^{-3}) > winter (11.72 ± 2.14 μg m^{-3}) > pre-monsoon (8.92 ± 1.58 μg m^{-3}) > monsoon (2.14 ± 0.42 μg m^{-3}). The higher NO_2 and pNO_3^- concentrations during the post-monsoon period can be attributed to the stubble burning in the Indo-Gangetic plains during this period, while their lower concentrations during the monsoon period can be attributed to the intermittent atmospheric cleansing by precipitation. The one-way ANOVA suggested that these seasonal variabilities in precursor gaseous NO_2 and pNO_3^- concentrations at the sampling site were statistically significant ($p < 0.05$). The transport paths of air masses reaching the site during sampling days were delineated by backward trajectory analysis, which showed that the NO_2 and pNO_3^- at this site were contributed from both local and transboundary sources.