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Sharing the Delhi Air: How do areas of low NO_x emission affect the Air Quality?

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NO_x flux has been measured at two sites in Delhi using the eddy-covariance method, during the autumn of 2018. The first site was located at the Indira Gandhi Delhi Technical University for Women on the edge of "Old Delhi" near the Red Fort and Kashmriri Gate where there is significant traffic flow and high population density in the flux footprint. The second site was located at the India Meteorological Department on Lodhi Road, just south of India Gate, surrounded by civil buildings, significant greenspace and comparatively less traffic volume. NO_x concentrations were measured at 5 Hz using a chemiluminescence-based analyser. Early footprint modelling suggests the calculated fluxes are localised within 400 m of the towers at each site.

The average NO_x flux at the University site was significantly higher than that of the Meteorological Department site: at the University site the peak NO_x flux around 10 am was in excess of 150 mg m^{-2} h^{-1}, over four times higher than at the Meteorological Department site. However, even with this striking difference in local NO_x emission rates, the differences in local air quality are negligible. Both sites experience an average of 40-70 ppbv of NO_2 across the day, and total NO_x regularly exceeds 400 ppbv overnight.

The work presented here illustrates the distinctive non-linearity between local emission and ambient air quality in Delhi: even in areas where local emission is low, the issue of air quality remains. This is a practical ramification of atmospheric dispersion yielding concentration fields that are mixed over larger areas than corresponding surface flux fields, such as reported e.g. by Schmid (1994) and Flesch (1996).

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