



Hourly elemental concentrations in ambient aerosols in New Delhi, India, measured with an online X-ray fluorescence spectrometer

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New Delhi is one of the cities with the highest air pollution in the world. Huge efforts are undertaken to characterize the air pollution situation and to reduce or mitigate the impact on the population and the environment. Modern instrumentation allows for a quantitative determination of aerosol concentration and composition with high time resolution (minutes to hours).

We collected PM₁₀ aerosols with an online X-ray fluorescence spectrometer in New Delhi from January to March 2018 with hourly time resolution. Elements from Al to Pb were analyzed in near-real time. PM_{2.5} filters collected in parallel with 12 h time resolution were analyzed offline with ICP-OES and ICP-MS, and used for comparison and quality assessment of the XRF data.

The New Delhi winter period 2018 was characterized by generally weak winds and dry, warm weather, inducing a strong diurnal cycle of the atmospheric boundary layer. This induced high PM concentrations during the night, with maxima in the early morning hours (around 07 h local time). Mean PM_{2.5} concentrations from 21 Jan through 15 Mar 2018 were 142.5 $\mu\text{g m}^{-3}$, with peak hourly values of 411 $\mu\text{g m}^{-3}$. Individual elements in PM₁₀ reached extreme 1-h peak concentrations, e.g. Cl approximately 140 $\mu\text{g m}^{-3}$, or Pb 17 $\mu\text{g m}^{-3}$. These values are consistent with other highly time-resolved data, but less so with the 12-h PM_{2.5} filter data, and further analysis in this respect is needed. In general, filter elemental concentrations were smaller than the averaged XRF concentrations.

Whether the high Cl concentrations hint towards industrial sources or garbage burning (e.g. PVC) requires a detailed source apportionment, which will be performed once the overall quality of the dataset has been established.