Extensive source apportionment of organic aerosols in New Delhi

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In 2014, New Delhi was ranked the most polluted city in South-East Asia regarding PM10 (WHO, 2014). Atmospheric aerosols are recognized to have adverse effects on climate, visibility and human health (Fuzzi et al., 2015). Therefore, the identification and source apportionment on those particles is of great importance. The Time-of-Flight Aerosol Chemical Speciation Monitor (ToF-ACSM, Aerodyne Research, Inc.) has been shown to be a robust instrument for long-term monitoring and characterization of atmospheric particulate matter (Fröhlich et al., 2013). The complex organic aerosol (OA) is further analyzed with positive matrix factorization (PMF) (Paatero and Tapper, 1994). The main limitation of PMF is the assumption of constant factors. However, chemical fingerprints of OA factors may change due to meteorology or seasonality. To overcome this limitation, a small and rolling PMF window is moved over the dataset and allows the factor profiles to vary over time. This rolling module is part of the new SoFi software (Canonaco et al., 2013).

The rolling window was applied to apportion OA sources in ToF-ACSM measurements ongoing since end of December 2017 in New Delhi, India. The window was shifted on a daily basis. In addition, PMF runs were resampled using the bootstrap algorithm (Davison and Hinkley, 1997) to estimate the statistical uncertainty of the PMF solution. The PMF runs resulting from the rolling and resampled PMF algorithm were post-analyzed using a set of criteria that defined the environmentally reasonable PMF runs.

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