Title:	Source apportionment of NMVOCs in the Kathmandu Valley during the SusKat-ABC international field campaign using positive matrix factorization
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Abstract:	A positive matrix factorization model (US EPA PMF version 5.0) was applied for the source apportionment of the dataset of 37 non-methane volatile organic compounds (NMVOCs) measured from 19 December 2012 to 30 January 2013 during the SusKat-ABC international air pollution measurement campaign using a proton-transfer-reaction time-of-flight mass spectrometer in the Kathmandu Valley. In all, eight source categories were identified with the PMF model using the new constrained model operation mode. Unresolved industrial emissions and traffic source factors were the major contributors to the total measured NMVOC mass loading (17.9 and 16.8 %, respectively) followed by mixed industrial emissions (14.0 %), while the remainder of the source was split approximately evenly between residential biofuel use and waste disposal (10.9 %), solvent evaporation (10.8 %), biomass co-fired brick kilns (10.4 %), biogenic emissions (10.0 %) and mixed daytime factor (9.2 %). Conditional probability function (CPF) analyses were performed to identify the physical locations associated with different sources. Source contributions to individual NMVOCs showed that biomass co-fired brick kilns significantly contribute to the elevated concentrations of several health relevant NMVOCs such as benzene. Despite the highly polluted conditions, biogenic emissions had the largest contribution (24.2 %) to the total daytime ozone production potential, even in winter, followed by solvent evaporation (20.2 %), traffic (15.0 %) and unresolved industrial emissions (14.3 %). Secondary organic aerosol (SOA) production had approximately equal contributions from biomass co-fired brick kilns (28.9 %) and traffic (28.2 %). Comparison of PMF results based on the in situ data versus REAS v2.1 and EDGAR v4.2 emission inventories showed that both the inventories underestimate the contribution of traffic and do not take the contribution of brick kilns into account. In addition, the REAS inventory overestimates the contribution of residential biofuel use and underestimates the contribution of solvent use and industrial sources in the Kathmandu Valley. The quantitative source apportionment of major NMVOC sources in the Kathmandu Valley based on this study will aid in improving hitherto largely un-validated bottom-up NMVOC emission inventories, enabling more focused mitigation measures and improved parameterizations in chemical transport models.
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