Title:	Characterization of ambient air pollution sources in Delhi NCR region using Thermal Desorption-Gas chromatography-flame ionization detector (TD-GC-FID), Proton transfer reaction-time of flight mass spectrometry (PTR-TOF-MS), and Cavity ring-down spectroscopy (CRDS) techniques
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Abstract:	Delhi frequently experiences extreme air pollution episodes. While policy measures have focused on reducing emissions from vehicles, efforts to regulate industrial emissions, especially of volatile organic compounds have received less attention. These sources contribute significantly, therefore we identified and targeted nine major industrial sources like landfills, waste-to-energy plants, coal thermal power plant, furniture market, washhouse to characterize their chemical emissions. This was done using Thermal Desorption-Gas chromatography-Flame Ionization Detector (TD-GC-FID), Proton Transfer Reaction-Time of Flight-Mass Spectrometer (PTR-ToF-MS 10K), and Cavity Ring Down Spectroscopy (CRDS). A total of 155 Volatile Organic Compounds (VOCs) were quantified comprising 25 alkanes, 17 alkenes, 1 alkyne, 19 aromatics, 42 oxygenated VOCs, and 51 mixed VOC classes. Carbon dioxide (CO 2), methane (CH 4), and nitrous oxide (N 2 O) were measured additionally among the greenhouse gases. The source profiles so obtained will aid in identification of factor profiles derived by Positive Matrix Factorization (PMF) analysis of ambient data. Here, I focused on presence of multiple toxic compounds, including carcinogens, benzene, toluene, ethylbenzene, and xylenes (o-xylene and m/p-xylene), collectively called BTEX, in addition to several marker compounds identified through enhancement ratio analyses, for use as indicators of pollution plumes emitted from the nine sources characterized in this study. Biomedical waste-to-energy plant in Jahangirpuri was identified to be a major emission source of CO 2 , CH 4 , CO, and all major VOC classes, with total VOC concentrations twice as high as ambient levels and CH 4 thrice as high. Unregulated industries such as the furniture market emitted carcinogens which were 3 times higher than ambient levels and the washhouse was found to be the top VOC emitter overall. Coal-fired VIlpower plants were low VOC emitters whereas landfills were major emitters of methane. Certain compounds such as ionene and oxonopinone which were previously considered to be primarily oxidation products of biogenic VOCs (BVOCs) were also detected in high amounts from certain sources shedding new light on their sources in the industrially influenced Delhi-NCR region. Overall, this study provides comprehensive new VOC speciation data from nine major industrial and urban sources in Delhi-NCR region, that will lea
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