Source Apportionment and Characterization of Urban VOCs in South Texas

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Corpus Christi urban airshed is a three county metropolitan statistical area located in South Texas. It is home to the sixth largest port in the United States and to several oil refineries and petrochemical complexes. These sources contribute to the volatile organic compound (VOC) levels measured in the ambient atmosphere over the urban airshed. VOCs serve as ozone precursors and some of these compounds are also known air toxic compounds. Determining the contribution of these VOC sources is critical for the development and implementation of effective emission control strategies in the region. Currently, the Texas Commission on Environmental Quality (TCEQ) collects and analyzes 24-hour averaged canister based samples at two continuous ambient monitoring stations (CAMS) – viz., Huisache (CAMS 98) and Hillcrest (CAMS 170). The primary focus of this study was to characterize and conduct source apportionment analysis using positive matrix factorization (PMF) on the measured ambient concentrations at CAMS 98 and CAMS 170 during 2002 through 2008. A six source model was resolved using PMF and these included refineries, petrochemical production, natural gas sources, evaporative emissions, vehicular emissions, and fugitive gasoline emissions. Refinery sources located along the ship channel were identified to be the largest VOC contributors and this accounted for 22% - 25% of the apportioned VOC concentrations. Natural gas source was estimated to be the second largest contributor (20% – 22%), and this was followed by evaporative and fugitive emissions (16% – 20%). The petrochemical production accounted for 13% - 15% and emissions from mobile sources accounted for 12% - 14% of the apportioned VOC levels. The results of the study will provide key information required by stakeholders and policy-makers alike to design and implement effective VOC control strategies.

Keywords: PMF, Volatile organic compounds (VOC), and Urban airshed.