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SOURCE APPORTIONMENT OF FINE PARTICULATE MATTER IN A SEMI-ARID COASTAL URBAN AREA OF SOUTH TEXAS

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ABSTRACT

Corpus Christi is located in a semi arid coastal region of South Texas. Continuous sampling of fine particulate matter as well as $PM_{2.5}$ speciation monitoring was conducted by the Texas Commission on Environmental Quality (TCEQ) several sites within the Corpus Christi urban airshed. Data was obtained from TCEQ for the study period of 2001-2004. The elemental species considered in this analysis included As, Br, Cr, Cu, Fe, Pb, Mn, Mo, Ni, Sn, V, Si, S, Ta, K, K^+, NH_4^+, Na, Na^+, elemental carbon, non-volatile nitrate and organic carbon. The daily averaged and the annual averaged $PM_{2.5}$ concentrations never exceeded the National Ambient Air Quality Standards of 65µg/m^3 and 15µg/m^3, respectively. However, the region was affected by long-range transport of aerosol particles associated with regional haze. Day-to-day and seasonal variations in the chemical composition reflect changes of contribution from various sources. A multivariate receptor model, UNMIX, was applied to identify potential sources of the $PM_{2.5}$. Six possible source categories were identified including sulfate from industrial sources, mobile source emissions, soil and dust, agricultural burns, sea spray and nitrates from multiple sources. Potential source contribution function (PSCF) was applied to the data to identify source contribution location and evaluate source-receptor relationship affecting the South Texas region. The middle Mississippi River valley, Ohio River valley, industrialized coastal areas of Texas, Mexico and Central America were identified as possible emission source regions contributing to the $PM_{2.5}$ mass, sulfate, nitrate, and EC/OC concentrations. Agricultural burning events were found to be distinct sources during the early spring months of April and May. This study identified atypical haze events such as the September 2002 regional haze event associated with agricultural burns in Mexico and Central America that typically affect the South Texas area.

Keywords: Fine particulate matter, $PM_{2.5}$, source apportionment, regional haze, semi-arid, coastal urban airshed