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Sources Affecting PM$_{2.5}$ Concentrations at a Rural Semi-Arid Coastal Site in South Texas

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ABSTRACT

Principal component analysis/absolute principal component scores (PCA/APCS) and positive matrix factorization (PMF2), an advanced factor analysis technique were employed to apportion the sources influencing the PM$_{2.5}$ levels measured during 2003 through 2005 at a rural coastal site located within the Corpus Christi urban airshed in South Texas. PCA/APCS identified five sources while PMF2 apportioned an optimal solution of eight sources. Both PCA/APCS and PMF2 quantified secondary sulfates to be the major contributor accounting for 47% and 45% of the apportioned PM$_{2.5}$ levels. The other common sources apportioned by the models included crustal dust, fresh sea salt and traffic emissions. PMF2 successfully apportioned distinct sources of fresh and aged sea salt along with biomass burns while PCA/APCS was unsuccessful in identifying aged sea salt and biomass burns; however it successfully identified secondary organic aerosols from photochemical oxidations and also emitted by petrochemical refineries. The influence of long range transport was noted for sources such as secondary sulfates, biomass burns and crustal dust affecting the region. Continued collection of speciation data at the rural and urban sites will enhance the understanding of local versus regional source contributions for air quality policy makers and stakeholders.

KEYWORDS

Positive Matrix Factorization (PMF2); Principal Component Analysis/Absolute Principal Component Scores (PCA/APCS); Coastal; Industrialized Urban

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