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Spatial Distribution and Source Apportionment of VOCs Using Passive Sampling at an Industrial City in Turkey

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Passive sampling were used to investigate levels and spatial distribution of Volatile Organic Compounds (VOCs) ranging from C_5 to C_{12} for aromatics, olefins, paraffins and halogenated organic compounds at multiple sampling sites at the city of Bursa, which has a population of 600 000, located on the Northwestern Turkey. The parameters that are measured by passive monitors include SO_2, NO_2, O_3 and 51 VOCs. Concentrations of these species were measured at 50 locations at a 22 km x 10 km area, which includes residential, traffic impacted and industrial sectors in the city one week at October 2005 and one week in April 2006. An online GC (Agilent Model 6890, gas chromatograph equipped with flame ionization detectors and coupled to a Unity Model thermal desorption and an Markes Air Server sampling system) were operated parallel with the passive samplers to determine the uptake rates of the VOC samplers under meteorological conditions that existed during passive sampling interval. In all campaigns except for industrial site, toluene was the most abundant VOC, followed by benzene and m&p xylenes. The distribution maps prepeared by interpolating data allowed us to differentiate hot spots in the city and identified locations where air quality monitoring stations should have been located. As expected, the center of the city with congested traffic, and Kukurtlu district, which is densely populated area in the city have the highest concentraitons of VOCs. SO_2 concentrations, on the other hand, were the highest at Osmangazi organized industrial area. Ozone concentrations were low within the city, due to destruction of ozone by high concentration of NO, and high at the peripherals of the city. Poisitve matrix factorization (PMF) was applied to

the VOC data to identify pollution sources affecting different sites. The PMF results indicated that vehicular exhaust emission made a significant contribution to ambient VOC levels. Solvent usages, combustion source for residential heating and industrial processes also contributed to the atmospeheric VOCs.