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Emission sources of carbonaceous aerosols in Mexico City deduced from radiocarbon analysis

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Fine aerosols are important for the earth's climate by scattering and absorbing sunlight and by modifying cloud characteristics. Furthermore, they have a negative impact on human health, as they contribute to respiratory and cardiopulmonary diseases and mortality. Carbonaceous particles are a major component of the fine aerosol. They originate from different anthropogenic and biogenic sources and are released as primary (i.e., directly emitted) particles or are formed as secondary organic aerosol (SOA) from volatile organic compounds (VOC) as gaseous precursors. Major anthropogenic emissions result from fossil fuel combustion and biomass burning. Biogenic carbonaceous aerosols mainly comprise plant debris, pollen, fungal spores, and bacteria as primary particles and SOA from biogenic VOC such as terpenes. For the identification and quantification of these sources, radiocarbon (^{14}C) determinations offer a unique possibility for unambiguous source apportionment of carbonaceous aerosol particles. This isotopic method enables a direct distinction of fossil and nonfossil carbon in ambient aerosols, because ^{14}C has decayed in fossil material, which makes possible an apportionment of anthropogenic and biogenic sources [Szidat et al., 2006].

Due to the increasing impact of megacitites, composition and source contributions of particulate matter at these locations are an important issue for the local and regional environment. We present ^{14}C measurements of organic carbon (OC) and elemental carbon (EC) of two aerosol filter samples from Mexico City, which were collected at the T0 site during the MILAGRO campaign 2006. On the one hand, results indi-

cate that EC originated nearly exclusively from fossil sources. On the other hand, OC showed a substantial contribution from nonfossil sources, which may stem from biogenic or biomass burning emissions. Although nonfossil OC was observed for smaller cities like Zurich (Switzerland) and Gothenburg (Sweden), its abundance in Mexico City was unexpected.

Szidat, S., et al.: Contributions of fossil fuel, biomass burning, and biogenic emissions to carbonaceous aerosols in Zürich as traced by ^{14}C, J. Geophys. Res., 111, D07206, doi:10.1029/2005JD006590, 2006.