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NMVOCs speciated emissions from mobile sources and their effect on air quality and human health in the metropolitan area of Buenos Aires, Argentina

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Since 2007, more than half of the world's population live in urban areas. Urban atmospheres are dominated by pollutants associated with vehicular emissions. Transport emissions are an important source of non-methane volatile organic compounds (NMVOCs) emissions, species of high interest because of their negative health effects and their contribution to the formation of secondary pollutants responsible for photochemical smog. NMVOCs emissions are generally not very well represented in emission inventories and their speciation presents a high level of uncertainty.

In general, emissions from South American countries are still quite unknown for the international community, and usually present a high degree of uncertainty due to the lack of available data to compile emission inventories. Within the Inter-American Institute for Global Change Research (IAI, www.iai.int) projects, UME-SAM (Urban Mobile Emissions in South American Megacities) and SAEMC (South American Emissions, Megacities and Climate, http://saemc.cmm.uchile.cl/), the effort was made to compute on-road transport emission inventories for South American megacities, namely Bogota, Buenos Aires, Lima, Sao Paulo and Santiago de Chile, considering megacities as urban agglomerations with more than 5 million inhabitants. The present work is a continuation of these projects, with the aim to extend the calculated NMVOCs emissions inventory into the individual species required by CTMs.

The on-road mobile sector of the metropolitan area of Buenos Aires (MABA), Argentina, accounted for 70 Gg of NMVOCs emissions for 2006, without considering two-wheelers. Gasoline light-duty vehicles were responsible for 64% of NMVOCs emissions, followed by compressed natural gas (CNG) light-duty vehicles (22%), diesel heavy-duty vehicles (11%) and diesel light-duty vehicles (7%). NMVOCs emissions were speciated according to fuel and technology, employing the European COPERT (Ntziachristos & Samaras, 2000) VOCs speciation scheme for gasoline and diesel vehicles and the USEPA SPECIATE (Simon et al., 2010) profile for CNG vehicles. NMVOCs emissions were composed of 31% aromatic compounds, 29% linear alkanes, 20% olefins, 12% ramified alkanes, 7% aldehydes and negligible contributions from cycloalkanes, ketones, Polycyclic Aromatic Hydrocarbons (PAHs) and other NMVOCs. Aromatic compounds dominated gasoline light-duty vehicles' emissions ($\sim$45%), while linear alkanes those of CNG light-duty vehicles ($\sim$80%). Aldehydes' contributions increased for diesel light and heavy-duty vehicles. VOCs speciation schemes for transport emissions were collected from the literature from Europe, USA, Asia, Oceania and Latin America with the aim to account for the associated uncertainty by compound for each fuel and technology type. The resulting individual NMVOCs emissions were used to calculate the corresponding tropospheric ozone formation (Carter, 1994), as well as the human toxicity potential in terms of 1.4 dichlorobenzene. Olefins and aromatic compounds in terms of species, and gasoline in terms of fuels, were found to impose the highest risk in urban environments regarding air quality and human health.