

CARBON MONOXIDE EMITTED FROM THE CITY OF BUENOS AIRES AND TRANSPORTED TO NEIGHBOURING DISTRICTS

N.A. MAZZEO[†], A.L. PINEDA ROJAS[‡] and L.E. VENEGAS[†]

Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)

[†] Dpto. de Ing. Química, Fac. Regional Avellaneda, Univ. Tecnológica Nacional, 1870 Buenos Aires, Argentina.

nmazzeo@fra.utn.edu.ar - lvenegas@fra.utn.edu.ar

[‡] Centro de Inv. del Mar y la Atmósfera (CIMA, UBA/CONICET), 1428 Buenos Aires, Argentina

pineda@cima.fcen.uba.ar

Abstract— Air pollutants emitted in a city may reach neighbouring areas. This paper describes and applies a methodology for estimating the CO transported from the City of Buenos Aires (CBA) to neighbouring districts. The methodology is applicable only for inert pollutants. This preliminary evaluation shows that 32% of CO annually emitted is transported to the de la Plata River. The smallest fraction (7.5% of annual emission) goes to the district of Avellaneda. The main factors controlling the outflow flux of CO are evaluated and their relative importance is discussed. It is also evaluated that the CO emissions in the CBA may contribute to 8h-CO background concentrations in the Metropolitan Area of Buenos Aires (MABA) with more than 10% of the Air Quality Standard. The districts of the MABA located west and northwest the CBA are the more affected by the CO emitted in the CBA.

Keywords— Air quality management; Air pollution impact; Buenos Aires; Carbon monoxide.

I. INTRODUCTION

The urban atmosphere is subjected to large inputs of anthropogenic contaminants arising from both stationary (power plants, industries, commercial and residential heating and cooking) and mobile sources (traffic and transportation). Urban air pollution poses a significant threat to human health and the environment throughout both the developed and developing world. There are studies (Fenger, 1999; Molina and Molina, 2004), which highlight the atmospheric pollution problems in large cities and the need to establish air pollution management and control programs. Within the framework of an urban air quality management system, atmospheric dispersion models provide a link between the source emissions and ambient concentrations. Urban dispersion models range from simple empirical models to complex three-dimensional urban air-shed models. Some examples of these models are the UAM model (Morris and Myers, 1990), the DAUMOD model (Mazzeo and Venegas, 1991); the UK-ADAMS Urban model (Carruthers *et al.*, 1994); the Danish OML model (Olesen, 1995); the UDM-FMI model (Karppinen *et al.*, 2000). Complex models may include some aspects of the microclimate of a city (e.g., temperature inhomogeneity, local circulations). The combination of complex models with local measurements would improve results of pol-

lutant dispersion in an inhomogeneous urban area (Mikhailuta *et al.*, 2009). Sometimes unavailable input data make application of complex numerical tools not possible, and simple urban background pollution models become an acceptable alternative (Berkowicz, 2000; Hanna *et al.*, 2002; de Leeuw *et al.*, 2002).

Air pollutant emissions within cities deteriorate local urban air quality. Furthermore, cities interact with their surroundings by exporting and importing pollution. The City of Buenos Aires (CBA) (34°35'S – 58°26'W) is a city-state and the capital of Argentina. It has an extension of 203km² and 2776138 inhabitants (INDEC, 2002) and is located on the west coast of the de la Plata River. The CBA is surrounded by 24 districts that belong to the Province of Buenos Aires (the “Greater Buenos Aires”, GBA). The GBA has an extension of 3627km² and 8684437 inhabitants (Fig. 1).

Each of the 24 districts has its own local government. At each district, its local environmental authority is required to evaluate the air quality condition and to define and implement air-pollution control measures for

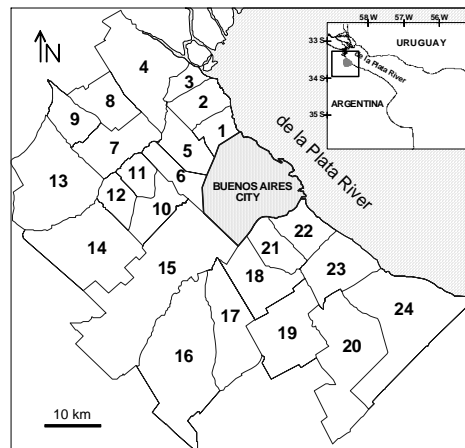


Fig. 1. Map of the Metropolitan Area of Buenos Aires, including the City of Buenos Aires and the Greater Buenos Aires. Districts of the Greater Buenos Aires: 1: Vicente López; 2: San Isidro; 3: San Fernando; 4: Tigre; 5: San Martín; 6: Tres de Febrero; 7: San Miguel; 8: Malvinas Argentinas; 9: José C. Paz; 10: Morón; 11: Hurlingham; 12: Ituzaingó; 13: Moreno; 14: Merlo; 15: La Matanza; 16: Ezeiza; 17: Esteban Echeverría; 18: Lomas de Zamora; 19: Almirante Brown; 20: Florencio Varela; 21: Lanús; 22: Avellaneda; 23: Quilmes; 24: Berazategui.

local sources. Therefore, knowledge of the amount of air pollutants coming from the CBA is useful for im-