

Title: Towards a Megacity project in Sao Paulo, Southeast of Brazil

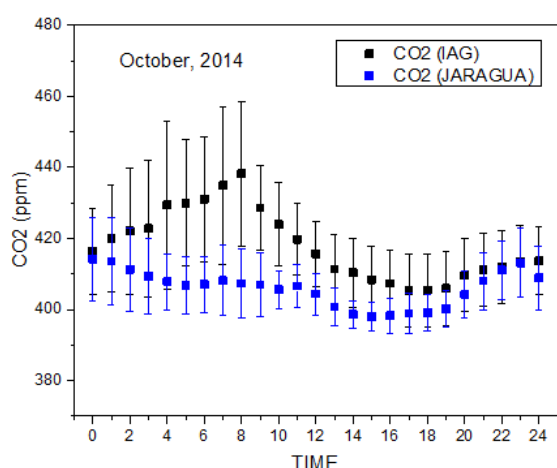
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Session IIIa: Megacities and Metrology Needs for Supporting Greenhouse Gas Mitigation- Urban Greenhouse Domes

Abstract:

The Metropolitan Area of Sao Paulo (MASP) has grown since the 50's becoming the most important region concerning the economy for the country. The city is characterized since its foundation by economic activities as commerce and services. In the last ten years, many industries have moved away from São Paulo. The most important source of air pollution is the vehicular emission that is responsible for more than 80% of the CO and VOC (Volatile Organic Compound) and more than 70% of NO_x emissions. The most important pollutants regarding events of high concentrations are Ozone and Fine Particles (MP2.5). These regulated pollutants have been studied for many years and their time and spatial distributions are well described. But the long-lived species have been addressed based on estimative of emissions from the burning of fuels and biomass (forested and agricultural areas). Since 2013, the Atmospheric Sciences Department started the regular measurements of CO₂, CH₄ and NH₃ to address the following aspects: formation of fine particles and ozone, temporal variation of CO₂ and the evaluation of the emission inventory of short and long-lived species in the



atmosphere. The Sao Paulo Megacity Project (SPMP) will address the gaps of measuring long-lived and short-lived species at the area and its related to the emission by the urban sources and the transport. Four components will be considered: measurements of ambient concentration, flux of CO₂ and CH₄, short-lived species and meteorological parameters; modeling of emissions in regional and local scale with satellite data evaluation of the emission data; modeling of dispersion and concentration; evaluation of impacts and risks. The MASP is impacted by the emission of 7 million vehicles, being 85% light-duty vehicles (LDV), 3% heavy-duty diesel vehicles (HDV)s, and 12% motorcycles. About 55% of LDVs burn a mixture of 78% gasoline and 22%

ethanol (gasohol), 4% use hydrous ethanol (95% ethanol and 5% water), 38% are flex-fuel vehicles that are capable of burning both gasohol and hydrous ethanol and 3% use diesel (diesel + 5% bio-diesel). The use of ethanol as vehicular fuel has to be analyzed considering the whole process of production and consumption. The emission of ozone precursors and the impact to human health consist in one aspect of the question, and the balance of CO₂ due to the growth of sugar-cane plantation is another aspect. Due to the large emissions of CO₂ and other GHG gases by the transport sector, its contribution is important in a regional and global scale. Measurements of CO₂ were performed with a Picarro monitor based on WS-CRDS (wavelength-scanned cavity ringdown spectroscopy) for the years 2012-2013. The sampling site was on the University of Sao Paulo campus (22°34'S, 46°44'W), situated in the west area of the city, surrounded by important traffic roads. The average data showed two peaks, one in the morning and the other in the afternoon, both associated with the traffic. Correlation analysis was performed between the concentrations and the number of vehicles, as a proxy for the temporal variation of the CO₂ emission. The highest concentration was 430 ppm at 8:00am, associated to the morning peak hour of vehicles and the stable condition of the atmosphere. The average concentration was 406 ±12 ppm, considering all measured data. The measured data of CO₂ and co-pollutants will be compared with retrieved data from satellite observations. It is presented one example of measurements performed at two sites in MASP, one downtown (IAG) and the other downwind of the central part of the city, in the Northwest region (Jaragua).