# Impact of biomass burning emissions on atmospheric aerosol burdens over the Sao Paulo Metropolitan Area

*Angel Liduvino Vara Vela[1], Maria de Fatima Andrade[1], Yang Zhang[2], Prashant Kumar[3], Rita Ynoue[1]

1. Sao Paulo Univ., 2. North Carolina State Univ., 3. Surrey Univ.

Since the gases and particles ejected into the atmosphere from fire emission events can modify the atmospheric composition around and even far away from the sources, an accurate representation of fire emissions in atmospheric chemical transport models is very important to improve the current understanding on how these emissions impact the aerosol properties over urban areas. In this study, the Weather Research and Forecasting with Chemistry (WRF-Chem) model, a state-of-the-art coupled meteorology-chemistry modelling system, is used to describe the physicochemical processes involving the emission, formation and transport of gases and aerosols in order to characterise the main properties of atmospheric aerosol particles over the Sao Paulo Metropolitan Area (SPMA), in southern Brazil, focusing mainly on the impact of biomass burning source. The study period of August 19 –September 3, 2014 is selected due to the occurrence of biomass burning of agricultural residues and high values of pollutants concentration in SPMA. To evaluate the impact of biomass burning it is considered the experimental data collected during the last campaign from the Narrowing the Uncertainties on Aerosol and Climate Change in Sao Paulo State (NUANCE-SPS) project and a set of two 18-day WRF-Chem simulations including different emission settings: with (BASE) and without (NFE) fire emissions. Ground-based aerosol observations from NUANCE-SPS include mass and number size distribution and CCN, elemental carbon (EC), and $PM_{2.5}$ ($PM_{2.5}$; 2.5 $\mu$m in diameter) and $PM_{10}$ ($PM_{10}$; 10 $\mu$m in diameter) concentrations. In addition, lidar profiles complemented with satellite observations are used to assess aerosol optical properties. Despite the meteorological conditions during most of the period were not favourable for long-range transport into SPMA, comparisons of the two simulations BASE and NFE with observations show that the inclusion of fire emissions can raise the concentration of fine particles by up to 8 ug/$m^3$ which in turn reduces the bias hence improving the model performance. Lower predicted $PM_{2.5}$ concentrations are mainly related to underestimates on the calculation of emissions as well as the SOA concentration.

Keywords: biomass burning emissions, atmospheric aerosols, WRF-Chem model

 