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Toward an integrated quasi-operational air quality analysis and prediction system for South America

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Recent industrialization and urbanization in South America (SA) have notably exacerbated the air pollution with adverse impacts on human health and socio-economic systems. Consequently, there is a strong demand for developing ever-better assessment mechanisms to monitor the air quality at different temporal and spatial scales and minimize its damages. Based on previous achievements (e.g., MACC project in Europe and PANDA project in East Asia) we aim to design and implement an integrated system to monitor, analyze and forecast the air quality in SA along with its impacts upon public health and agriculture. An initiative will be established to combine observations (both satellite and in-situ) with advanced numerical models in order to provide a robust scientific basis for short- and long-term decision-making concerning air quality issues in SA countries. The main objectives of the project are defined as 3E: Enhancement of the air quality monitoring system through coupling models and observations, Elaboration of comprehensive indicators and assessment tools to support policy-making, Establishment of efficient information-exchange platforms to facilitate communication among scientists, authorities, stockholders and the public.

Here we present the results of the initial stage, where a coarse resolution (50×50 km) set up of Weather Research and Forecast model with Chemistry (WRF-Chem) is used to simulate the air quality in SA considering anthropogenic, biomass-burning (based on MACCity, FINN inventories, respectively) and biogenic emissions (using MEGAN model). According to the availability of the observation data for Metropolitan Area of São Paulo, August 2012 is selected as the simulation period. Nested domains with higher resolution (15×15 km) are also embedded within the parent domain over the megacities (Sao Paolo and Rio de Janeiro in Brazil and Buenos Aires in Argentina), which account for the major anthropogenic emission sources located along coastal regions of the continent. Fire and biogenic emissions on the other hand mainly take place within the inner parts of the continent in for e.g. Amazon basin and sugarcane in Sao Paulo State. Contributions of these emission sources in reactive gases (e.g., CO, O_3, NO_x) and particulate matter concentrations are quantified. Next step is to examine different emission inventories and observation data to find an optimal description for the atmospheric composition in SA.