



NEW ANTHROPOGENIC EMISSION DATABASE UPGRADED WITH SOUTH AMERICAN INVENTORY DATA

Marcelo Felix Alonso.

PhD student at the Center for Weather Prediction and Climate Studies (CPTEC/INPE), Brazil.

Karla Maria Longo.

Center for Space and Atmospheric Sciences (CEA/INPE), Brazil.

Saulo Ribeiro de Freitas.

Center for Weather Prediction and Climate Studies (CPTEC/INPE), Brazil.

Rafael Mello da Fonseca.

Center for Weather Prediction and Climate Studies (CPTEC/INPE), Brazil.

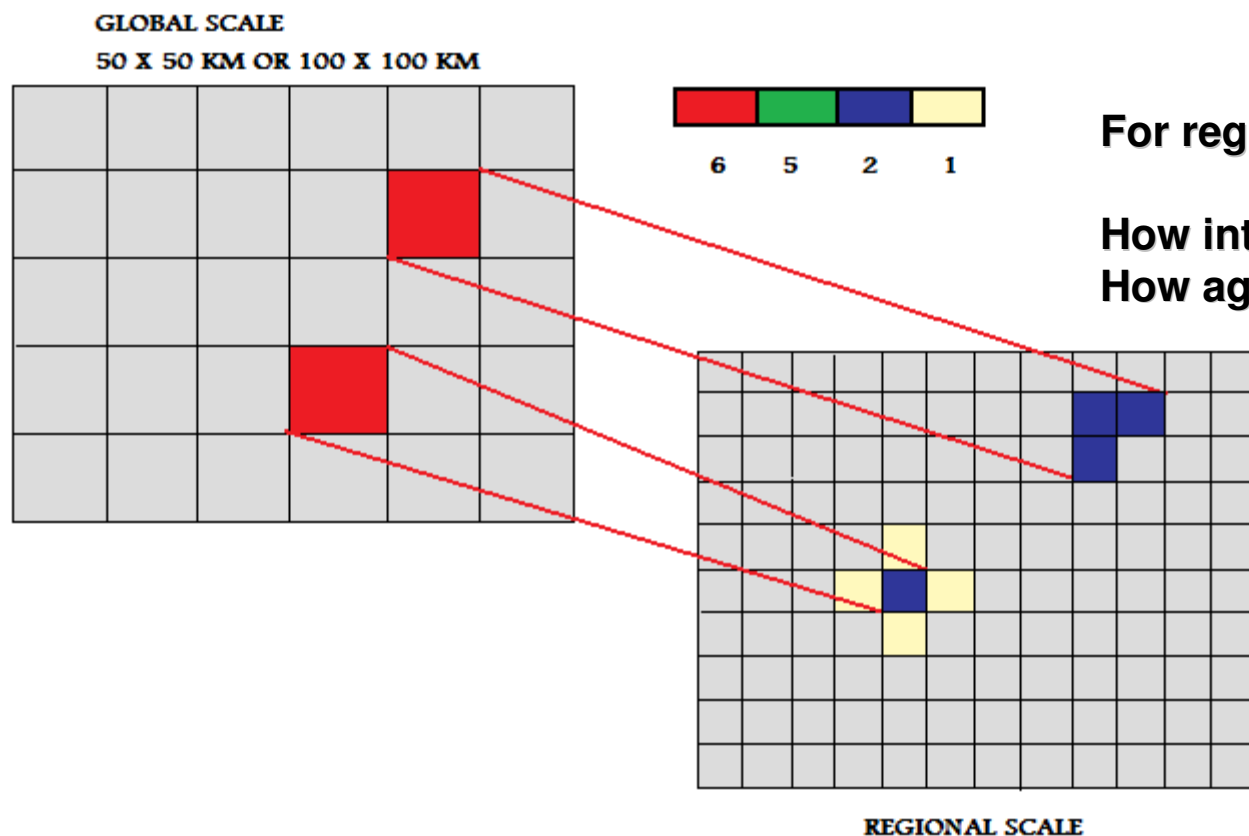


South American Emissions, Megacities and Climate

SAEMC 2006 -2010

In context of the SAEMC project (South American emissions, megacities and climate), this work addresses the upgrade and validation of numerical models and tools for studies associated with atmospheric chemical composition change over South America and its impact on regional climate change. For these we need of a good representation of emissions in this scale.

Largescale emission inventories are inaccurate representations of current emissions, but the state of the art on the global and regional scales.



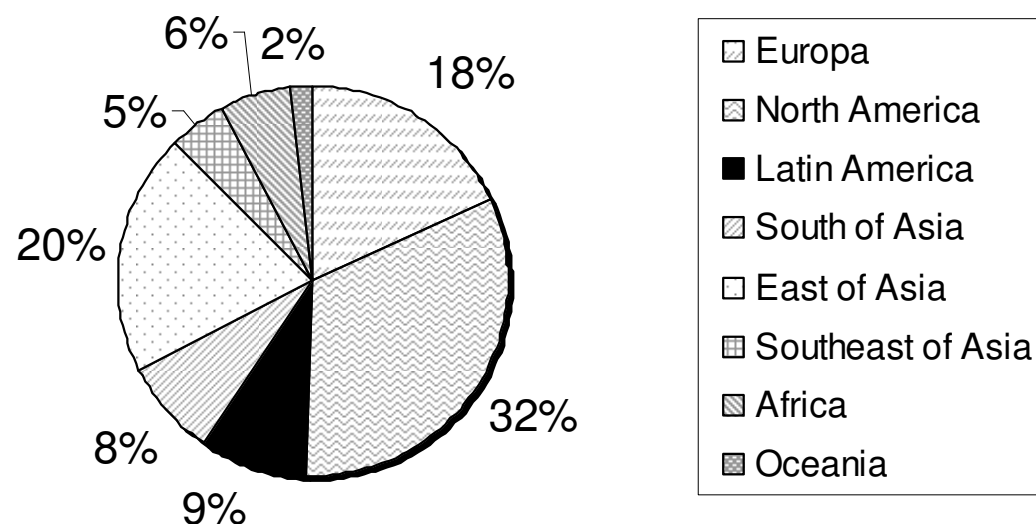
For regional scale:

How interpolate global emissions ?

How aggregate local inventories ?

The first step was the updating of current global emissions inventories with a new dataset of local inventories, and the implementation of emission scenarios in the model system.

RETRO CO EMISSIONS



From Schultz et al. (2007)

c

INVENTORIES

BRAZIL

**São Paulo Metropolitan Area
Campinas Metropolitan Area
Sorocaba City
São José dos Campos City**

(CETESB – <http://www.cetesb.sp.gov.br>)

(FEEMA– <http://www.feema.rj.gov.br>)

Rio de Janeiro Metropolitan Area

Porto Alegre Metropolitan Area

Teixeira et al. [2008]

CHILE

Santiago City

Schmitz [2005]

COLOMBIA

Bogotá City

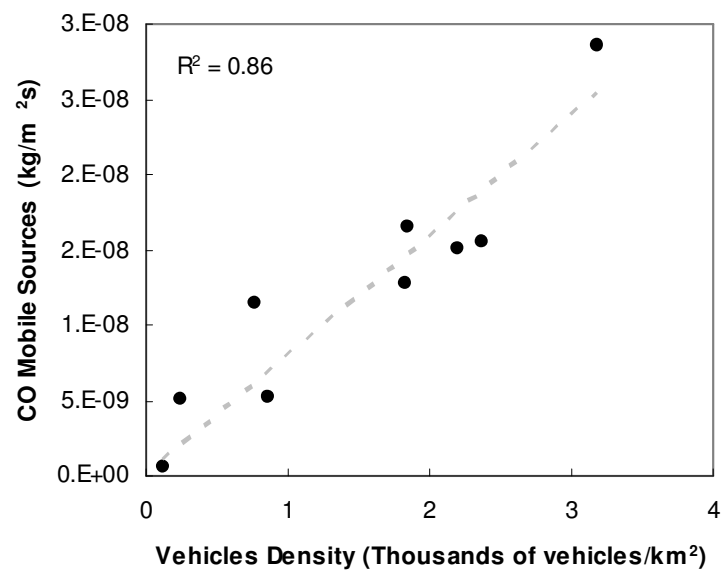
GIIA (Centro de Investigaciones en Ingeniería Ambiental)
Universidad de Los Andes

ARGENTINA

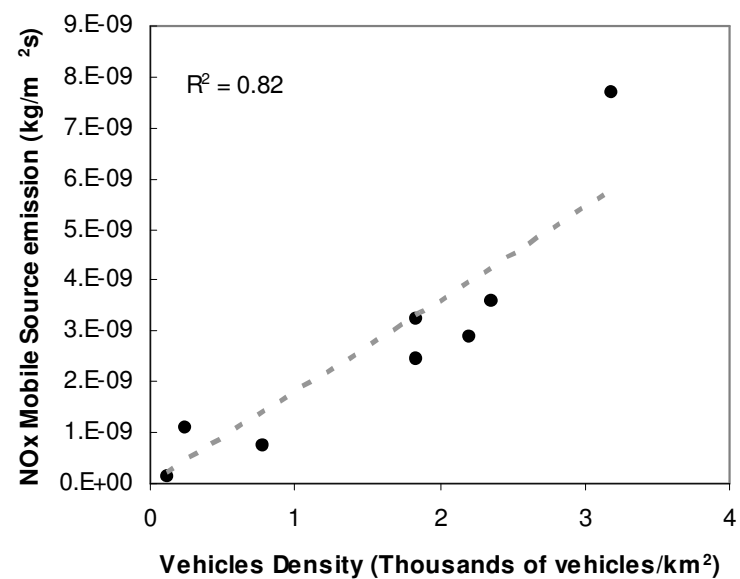
Buenos Aires Metropolitan Area

Dangiola et al. [2004]

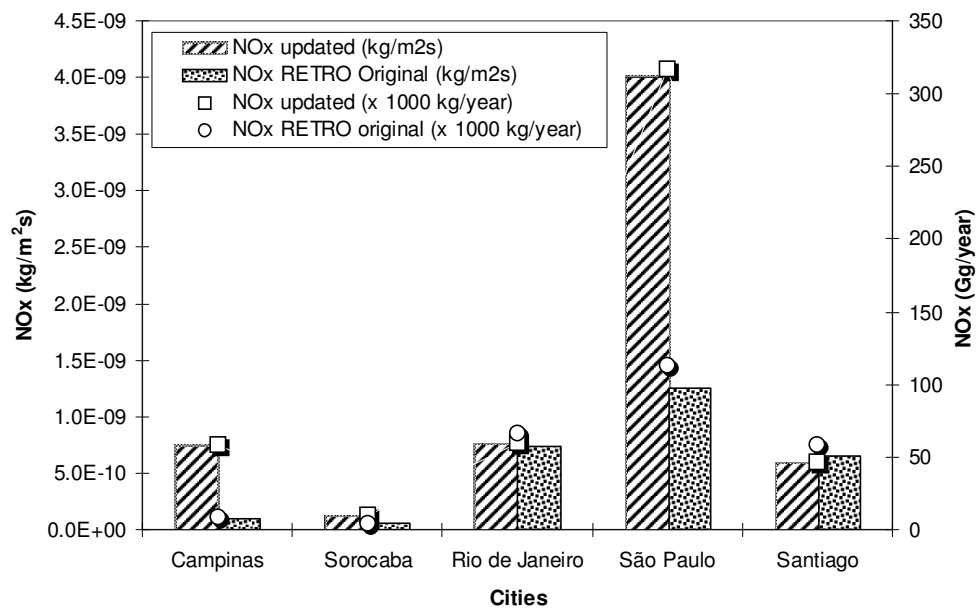
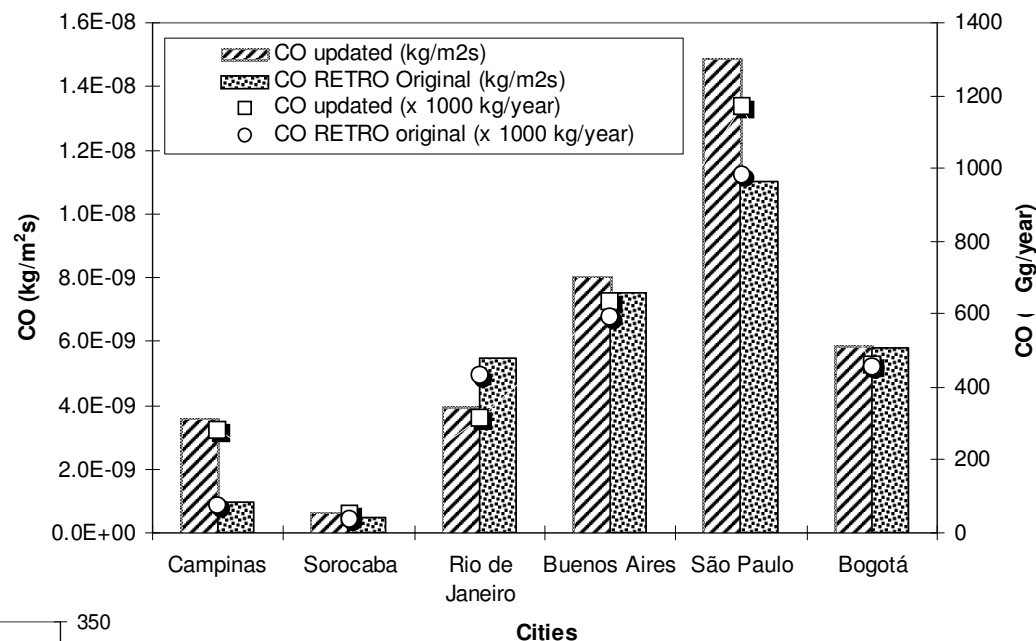
Vehicles Density X CO emissions



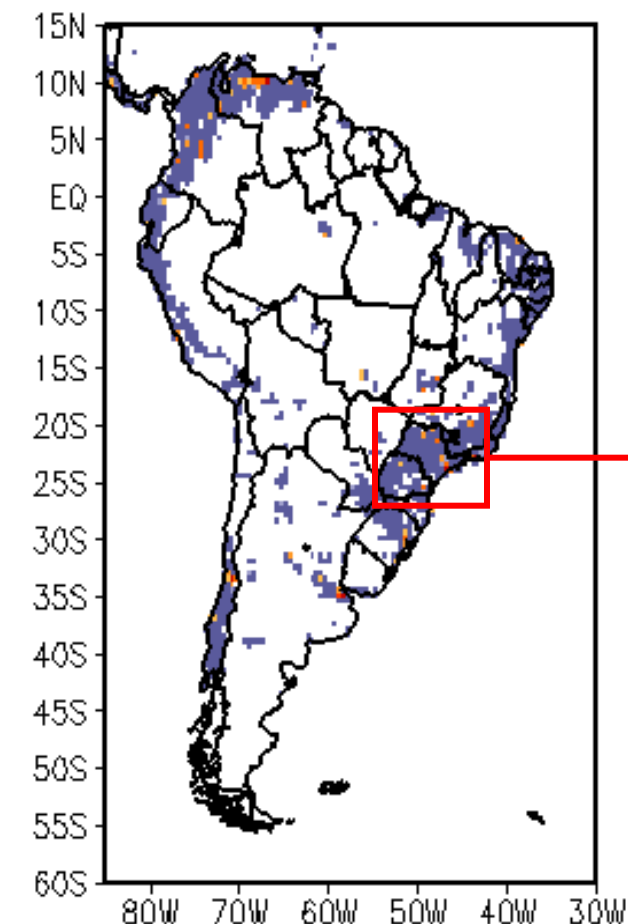
Vehicles Density X NOx emissions



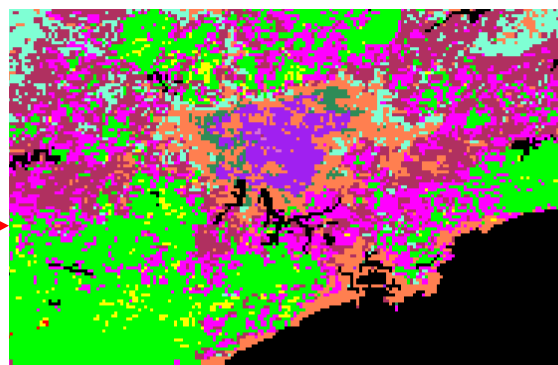
SOME EXAMPLES



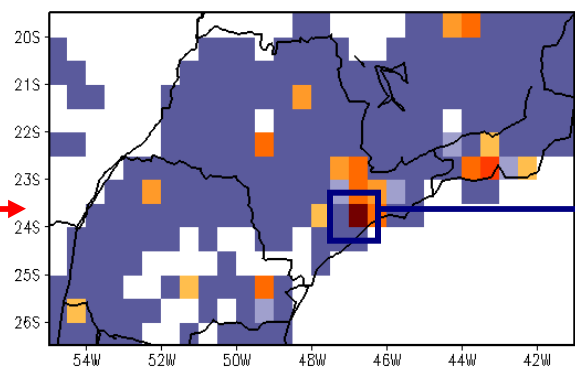
SPATIAL DISTRIBUTION FOLLOW THE POINT IN POLYGON ALGORITHM CONCEPT



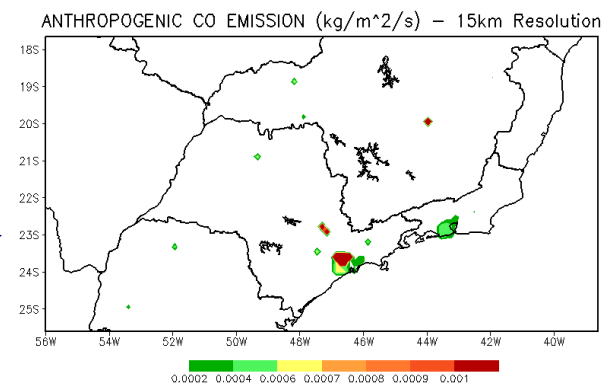
Carbon Monoxide (CO) emissions ($\times 10^7$ kg/a).



This information is interpolated to the model grid using the geometrical algorithm Point in Polygon. The urban area is obtained using the AVHRR/NOAA land cover product [2].



Upgraded CO emission ($\times 10^7$ kg/ano)

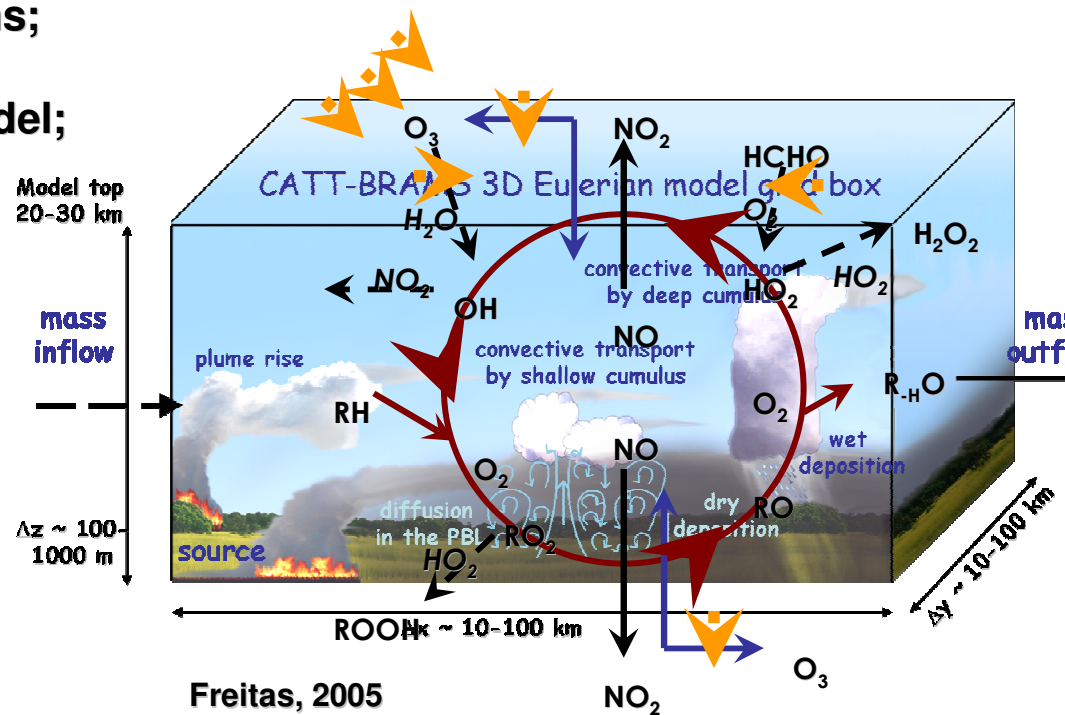


Validation: CCATT-BRAMS MODEL

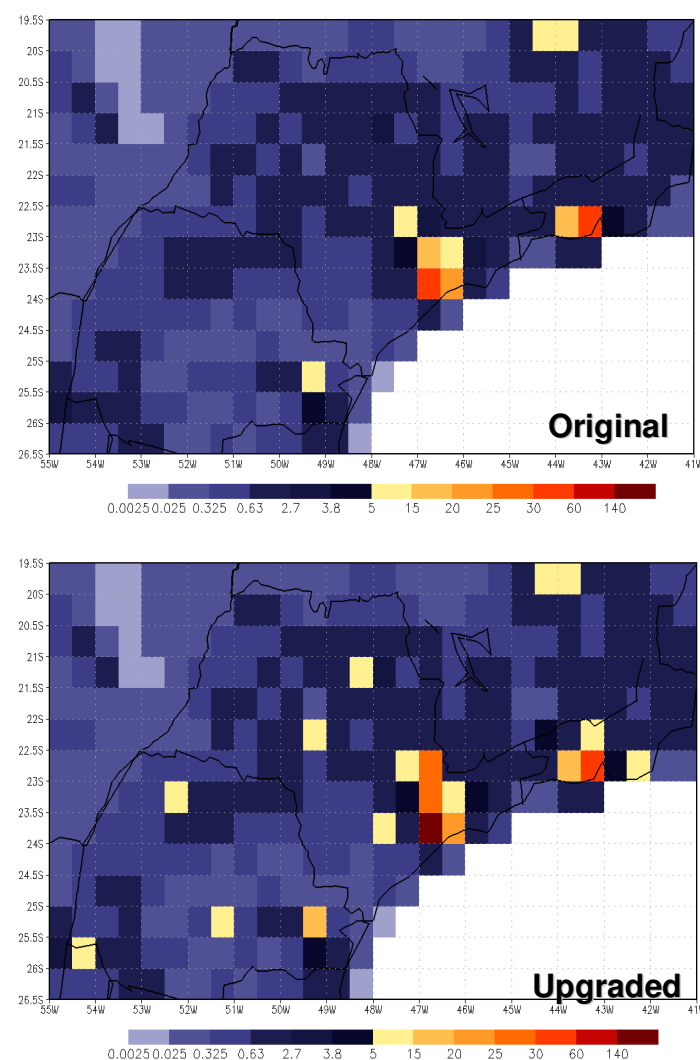
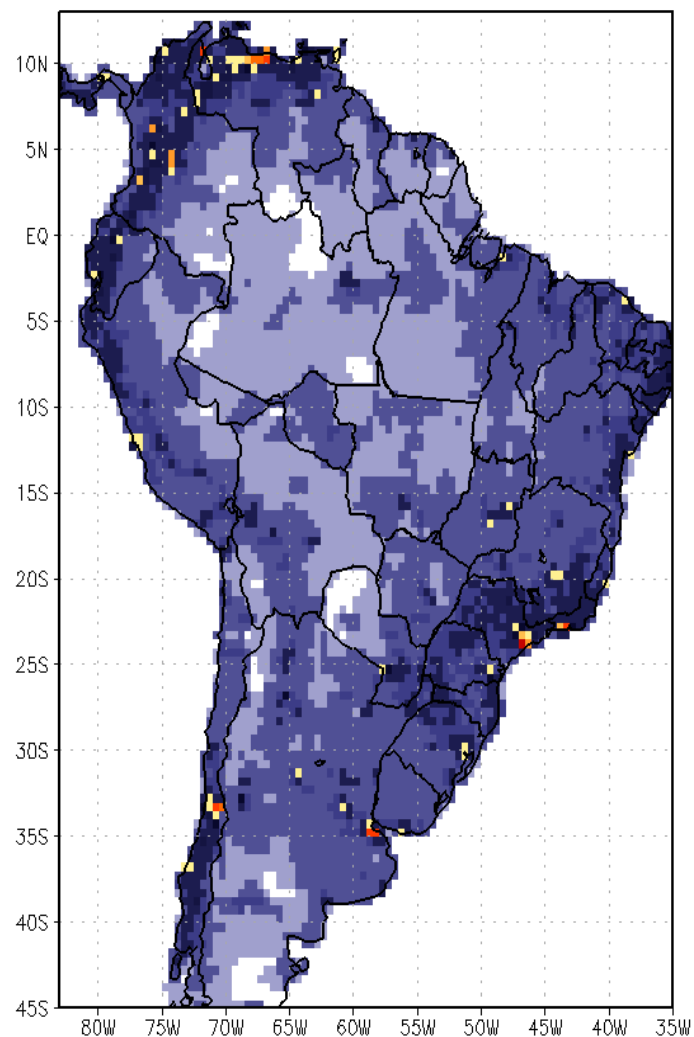
-CCATT-BRAMS is an Eulerian chemistry transport model that solves the mass conservation equation for tracer mixing ratios including: advection, turbulence in the Planetary Boundary Layer (PBL), wet and dry deposition, a plume rise scheme, and shallow and deep convection. The model also includes chemical reactions and interaction between tracers and radiation (short and long wave) [Freitas, 2007 and Longo, 2007].

SOME CHARACTERISTICS:

- Chemical initial and boundary conditions;
- Photolysis ratio from the FAST TUV model;
- Chemistry Mechanisms: RACM, RADM2 and CB07.

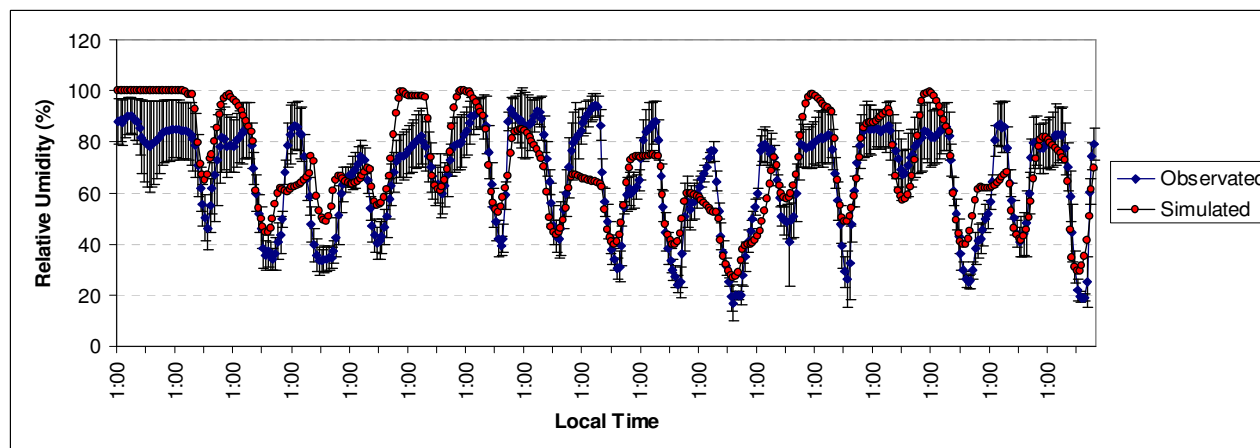
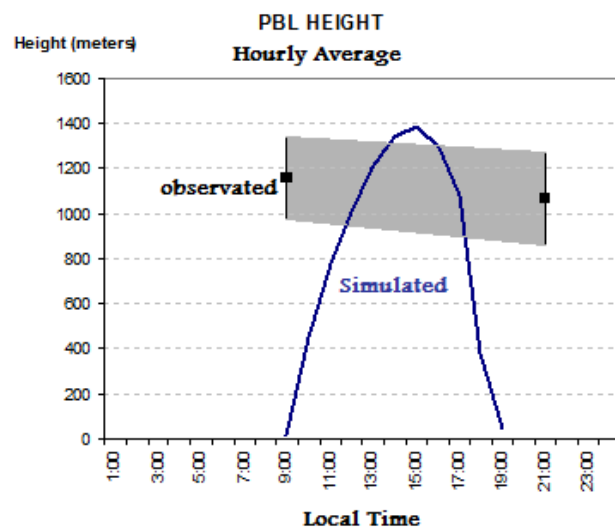
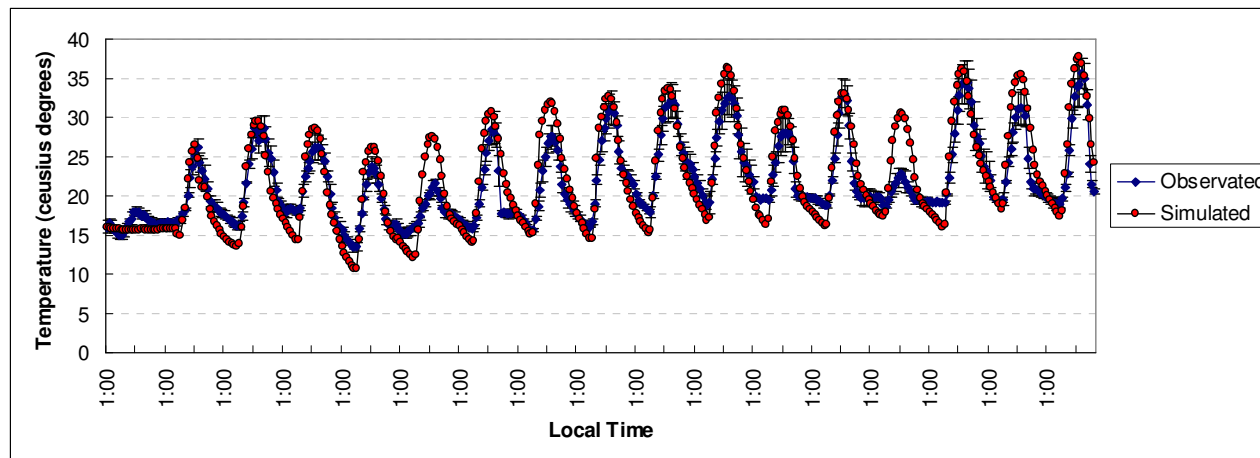


Example: Southeastern Brazil



Carbon Monoxide (CO) emissions ($\times 10^7$ kg/ano).

Period: September/2004

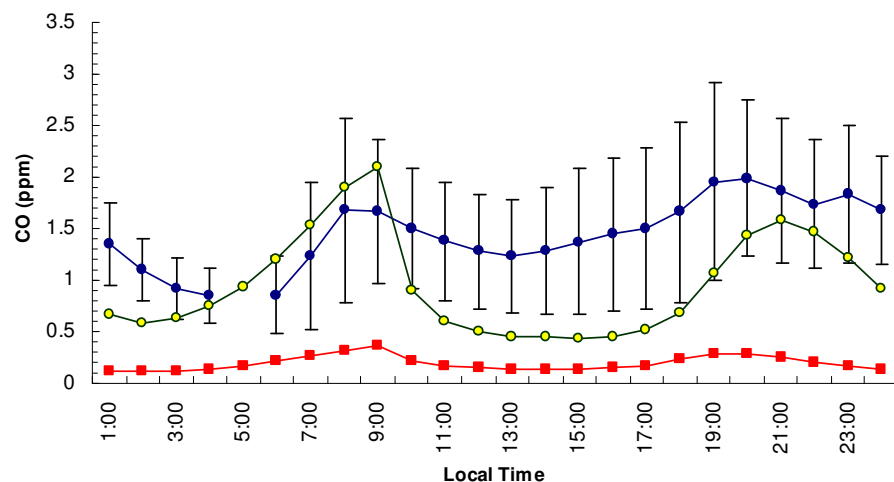


Grid:

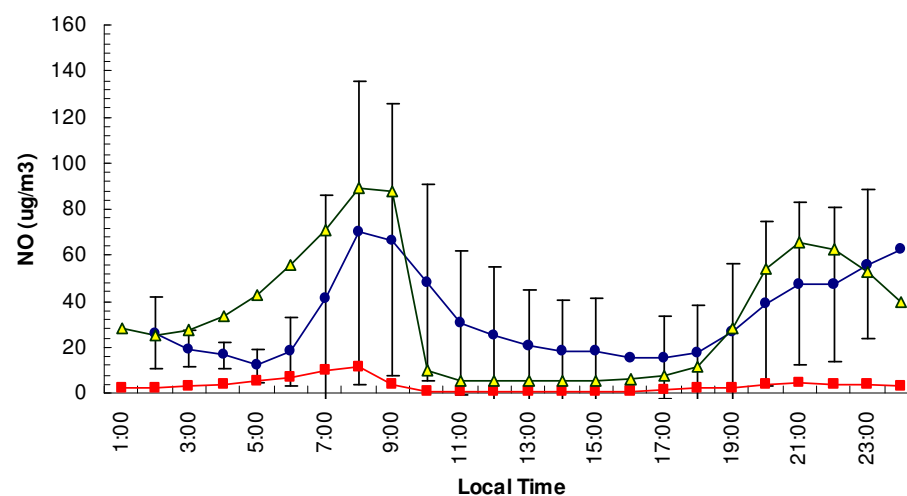
15 km resolution

Atmospheric IC and BC from T126L42 Global model CPTEC/INPE

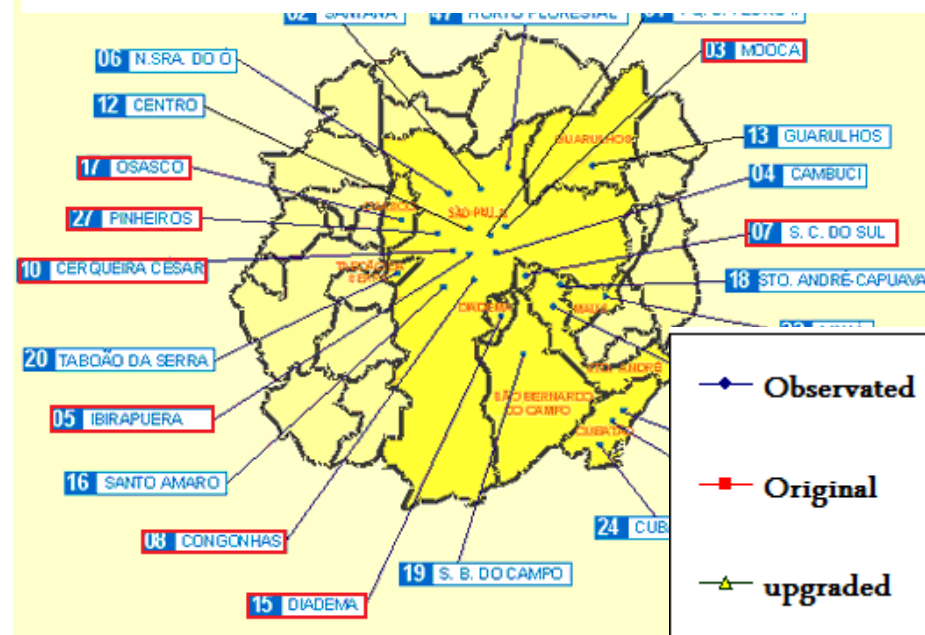
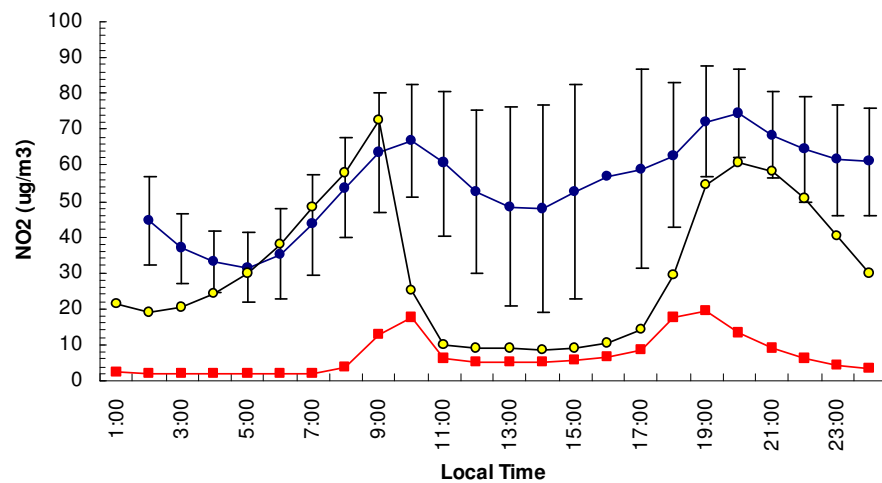
Hourly Average (September 2004)

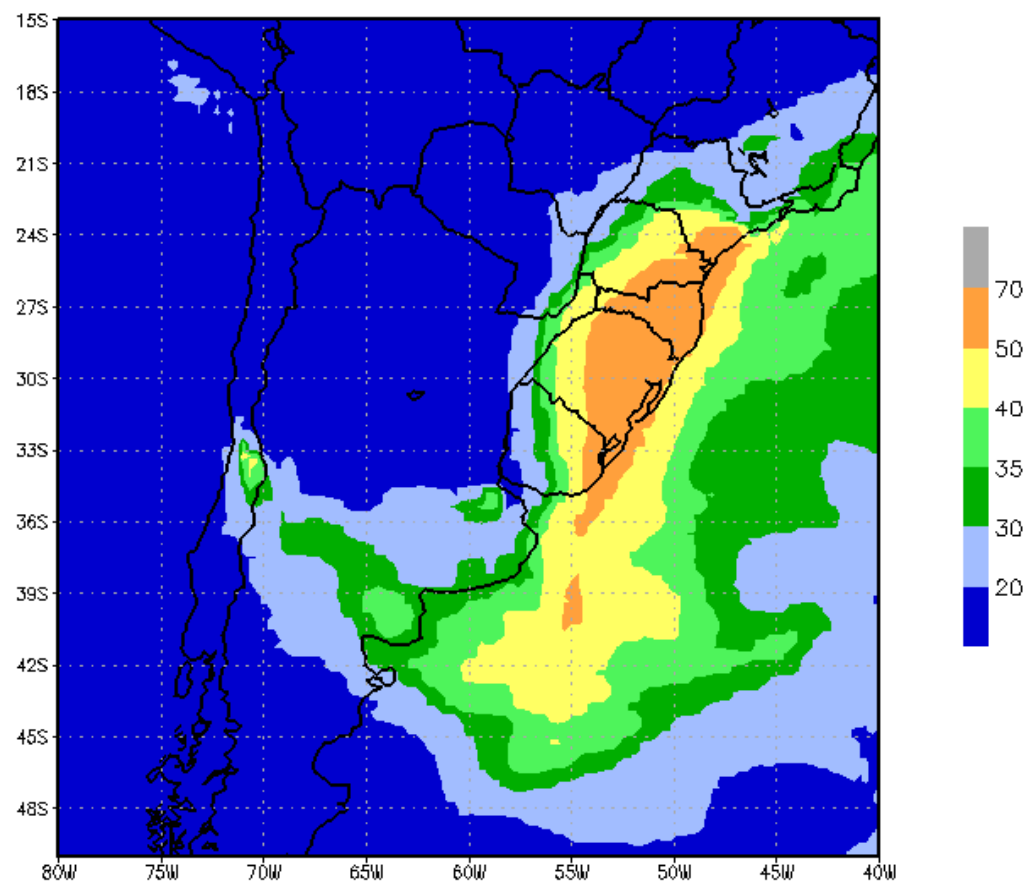


Hourly Average (September 2004)



Hourly Average (September 2004)





**Footprint [Percent of megacities influence / September 2007]
Ozone**

- The global scale anthropogenic emission database (RETRO) has been updated with South American local inventories;
- The CO and NOX concentrations have been improved;
- The update of the emissions and the spatial distribution is important to better represent emissions of megacities on a regional scale.

PERSPECTIVES

In the forthcoming phase of this project, simulations for recent years over South America will be performed. The last stage will address the inclusion of climate change scenarios for South American megacities with the objective of studying the regional climate change associated with urban expansion and atmospheric chemical composition change.

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MUCHAS GRACIAS!

Marcelo.alonso@cptec.inpe.br

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