

Preparation of the First National Emissions Inventory for Modeling in Mexico

16th Annual International Emission Inventory Conference
Raleigh, North Carolina

Zac Adelman

UNC Institute for the Environment

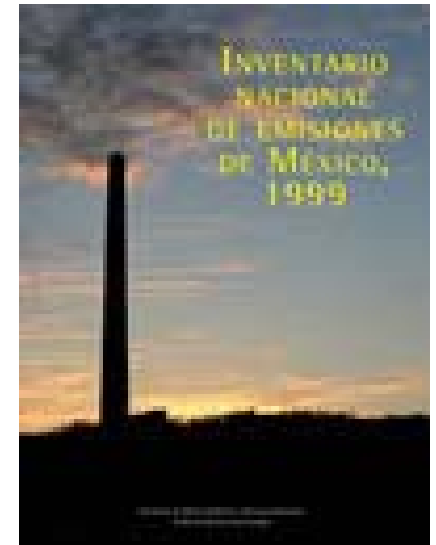
David Parra, Tania López, Rodolfo Iniestra
Instituto Nacional de Ecología



UNC
INSTITUTE FOR
THE ENVIRONMENT

Background

- ❑ The data and report of the first national emission inventory for Mexico (MNEI) were published in September, 2006.
- ❑ National Institute of Ecology (INE) is adapting the CAMx model to Mexican conditions in order to evaluate emission control measures at a national level in the near future.
- ❑ Emissions input data to CAMx are being processed with SMOKE modeling system at INE with support from UNC



Characteristics of the MNEI, 1999

❑ Coverage

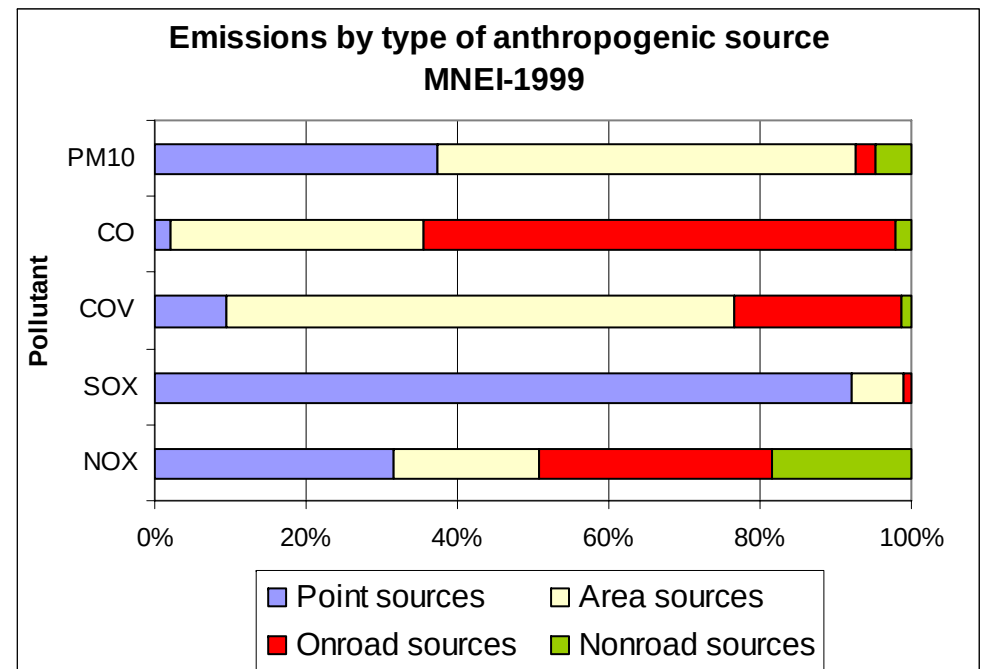
- States (32)
- Municipal (2,443)

❑ Sources (#SCC's)

- Point (28)
- Area (46)
- On road mobile (7)
- Nonroad (2)
- Natural sources (2)

❑ Pollutants

- CO, NO_x, SO_x, PM₁₀, PM_{2.5}, VOC and NH₃

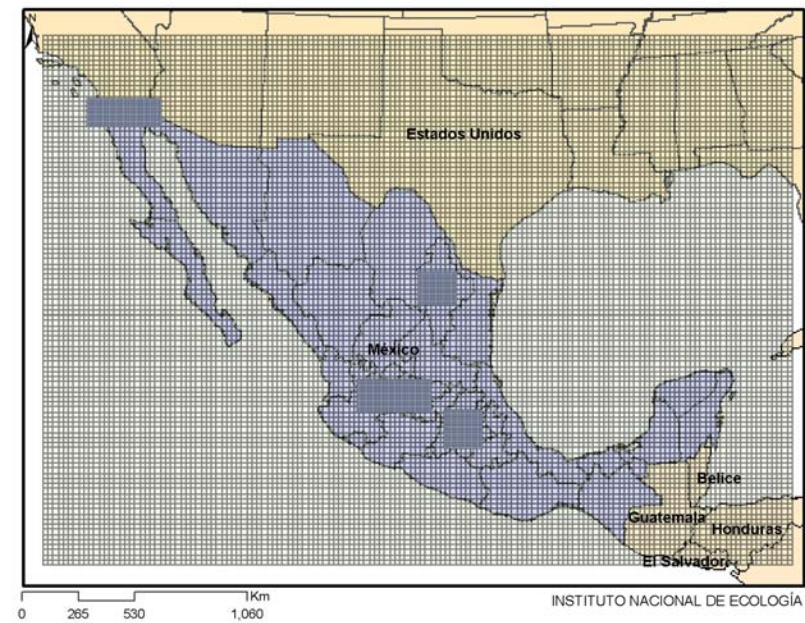


Objective

Use the SMOKE modeling system to prepare the MNEI for annual and episodic air quality modeling with CAMx on one parent grid and four nested grids with CB-IV chemical speciation.

Modeling domains

Dom	# Grid Cells		dx	Description
	X	Y		
1	147	104	24 km	Mexico, southern U.S and part of Central America
2	23	23	8 km	Metropolitan Mexico City
3	44	20	8 km	Metropolitan Guadalajara
4	23	20	8 km	Metropolitan Monterrey
5	44	17	8 km	Tijuana and Mexicali



Methodology: Temporal profiles

- ❑ Currently using U.S. temporal profiles assigned by SCC
- ❑ Recommendations
 - Collect operational data from high priority sources and develop Mexico-specific profiles
 - Use fuel sales trends for combustion source profiles

Methodology: Spatial allocation

- ❑ Area, nonroad and on road sources allocated using 19 surrogates
 - Created with The Emission Modeling Framework Surrogate Tool
- ❑ Point sources allocated by lat-lon coordinates
- ❑ Recommendations
 - Evaluate the representativeness of the surrogates created
 - Improve point source location data (>50% were located at municipality/locality centroid)

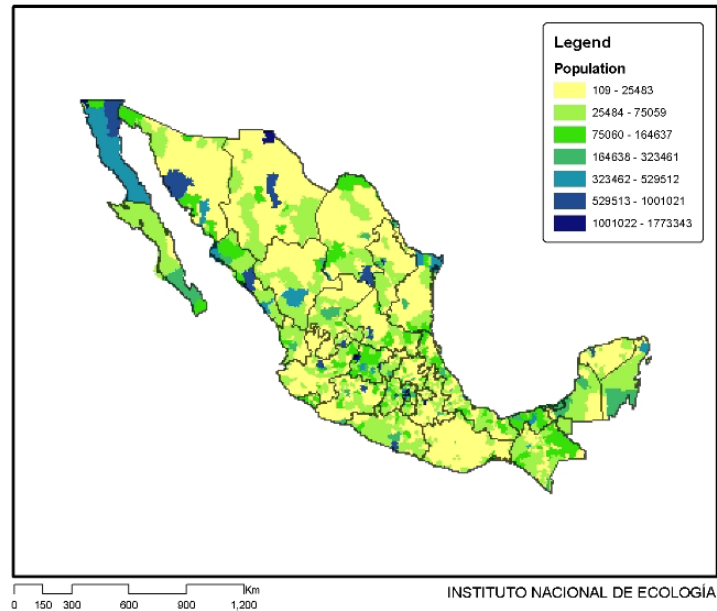
Methodology: Chemical Speciation

- ❑ Currently using US profiles assigned by SCC
 - SPECIATE 3.0 profiles
 - U.S. data based on limited source test
- ❑ Recommendations
 - Source testing to develop Mexico profiles
 - Try to adapt available information for Mexico City Metropolitan Area to whole country
 - Lower priority than other parameters due to technical difficult and expense

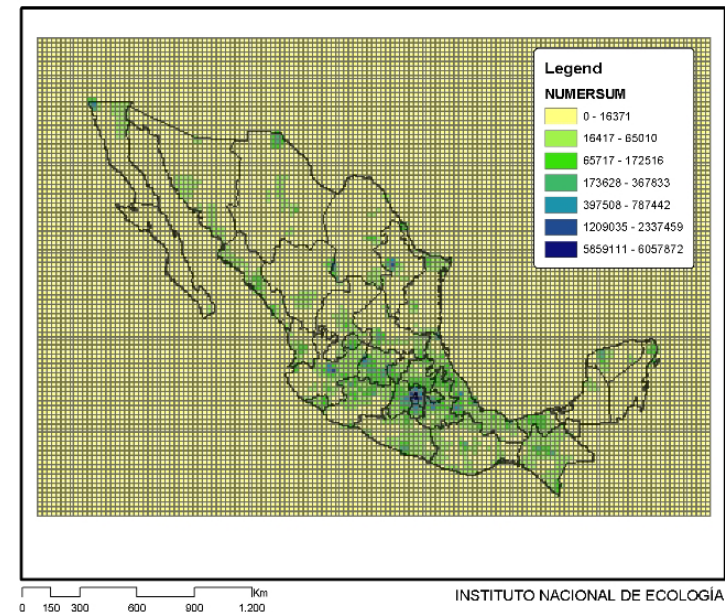
Results: Spatial Surrogates

- Brick kilns
- Mobile sources
- Population
- Housing
- Residential heating
- Total road miles
- Total railroads miles
- Total agriculture
- Forest land
- Land area
- Commercial land
- Industrial Land
- Commercial plus industrial land
- Commercial plus institutional land
- Housing
- Residential + Commercial + Industrial + Government
- Personal repair
- Airport Point
- Marine Ports

Results: Spatial Surrogates Population



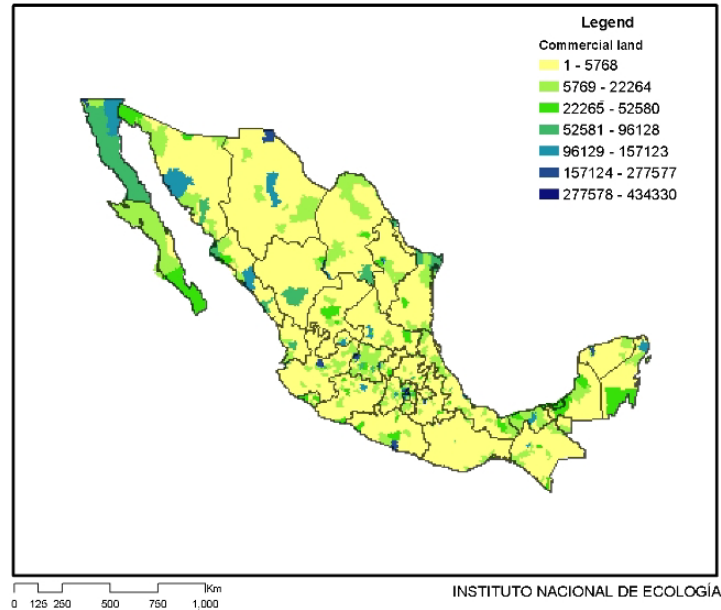
Shape file created from
Census 2000



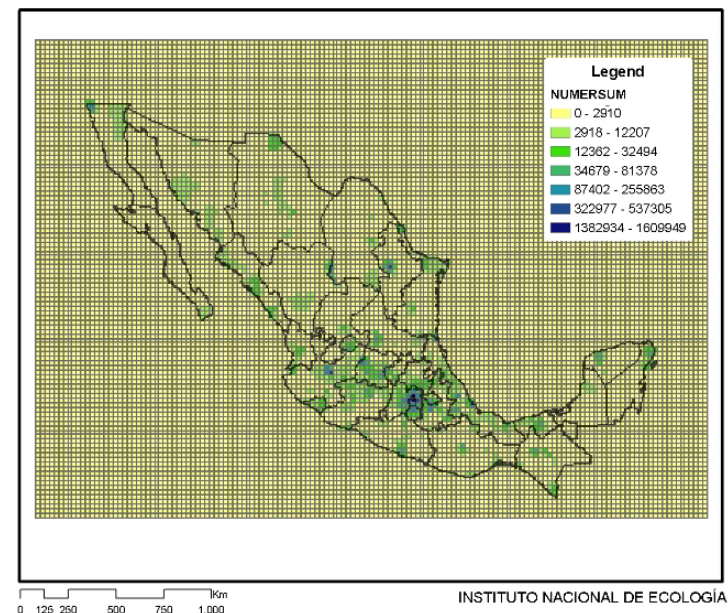
Surrogate for:

- Solvent Utilization
- Miscellaneous Non-industrial: Consumer and Commercial
- Etc.

Results: Spatial Surrogates Commercial Land



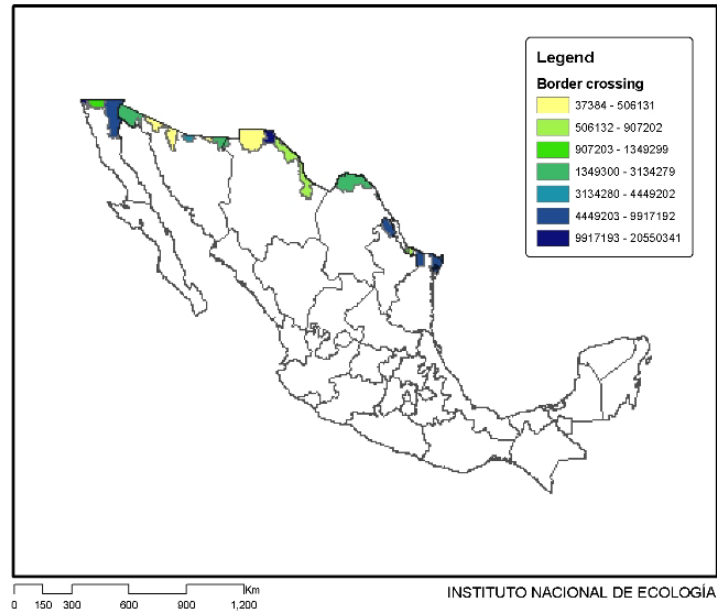
Shape file created from data base of the economic census of 1999.



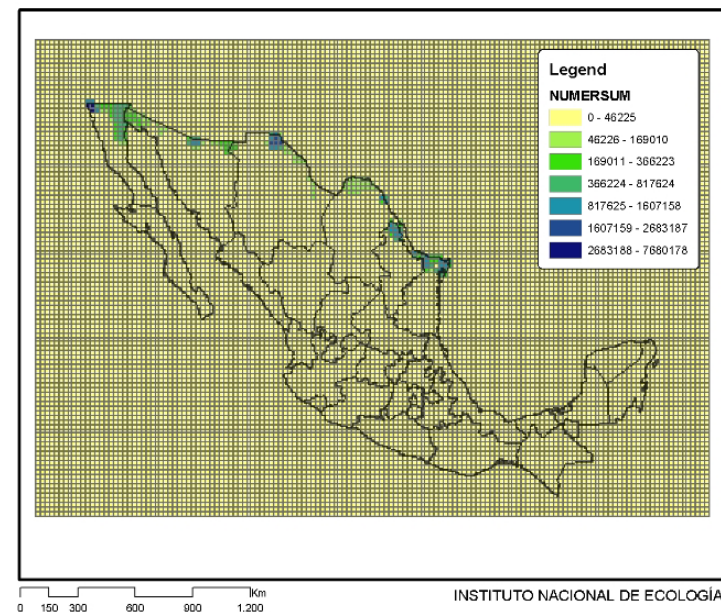
Surrogate for:

- Industrial process; Bakery Products
- Storage and Transport; Petroleum and Petroleum Product Storage

Results: Spatial Surrogates Border Crossings



Shape file created from
data base of the Board of
statistical transport (1999)

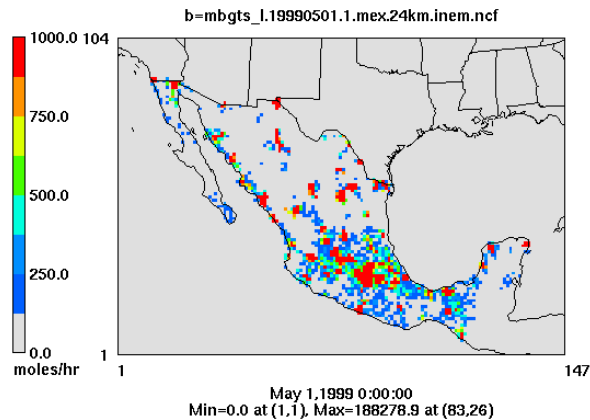


Surrogate for:

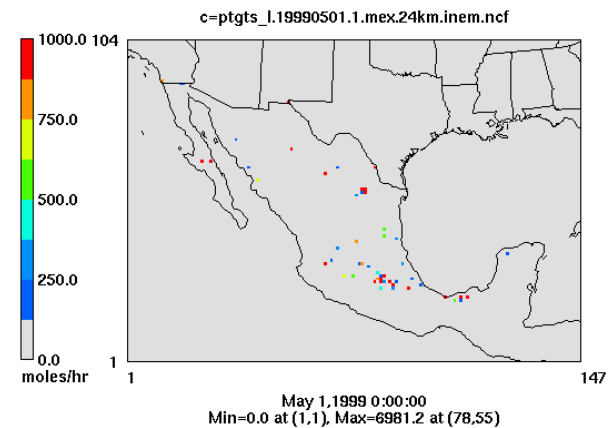
- Mobile Sources; Border Crossing, Mexico

Results: Preliminary NO_x Spatial Emission Distribution

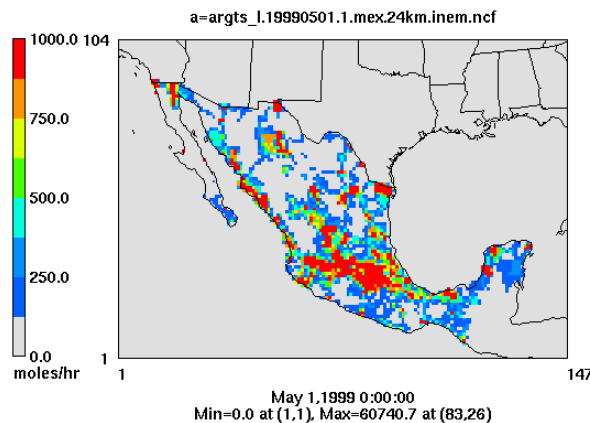
NO_x Mobile Sources



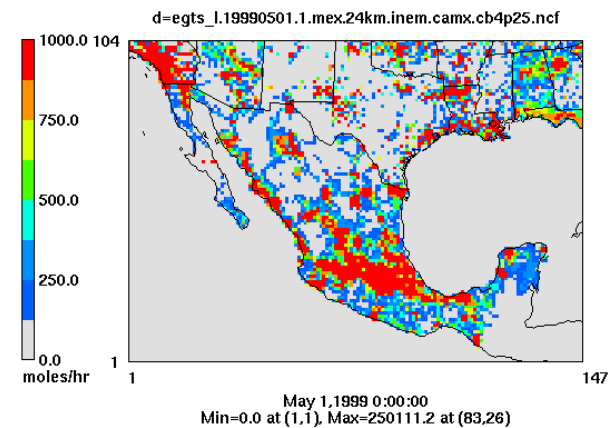
NO_x Point Sources



NO_x Area Sources



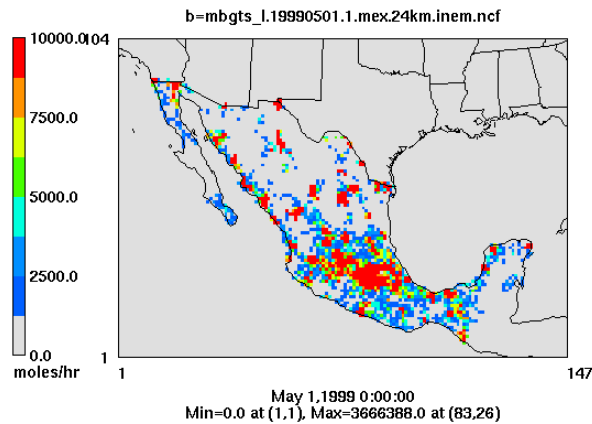
NO_x All Sources



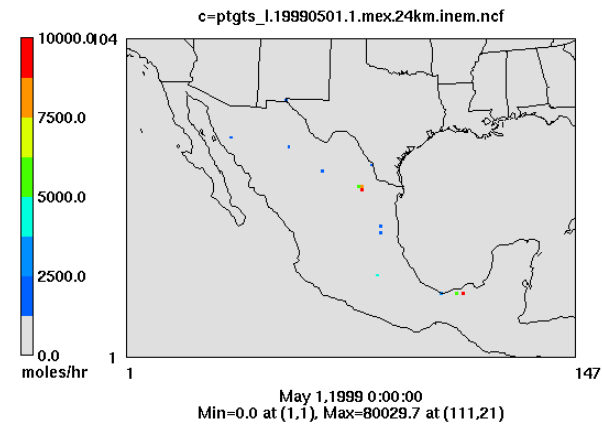
Note: Quality assurance in progress

Results: Preliminary CO Spatial Emission Distribution

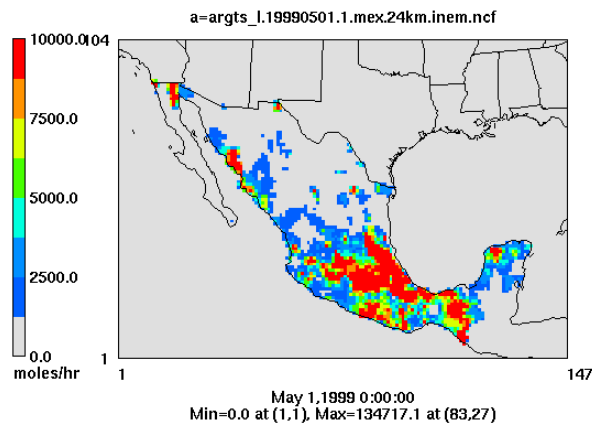
CO Mobile Sources



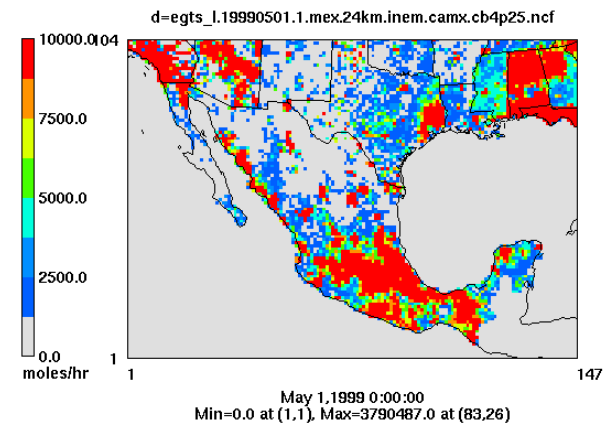
CO Point Sources



CO Area Sources



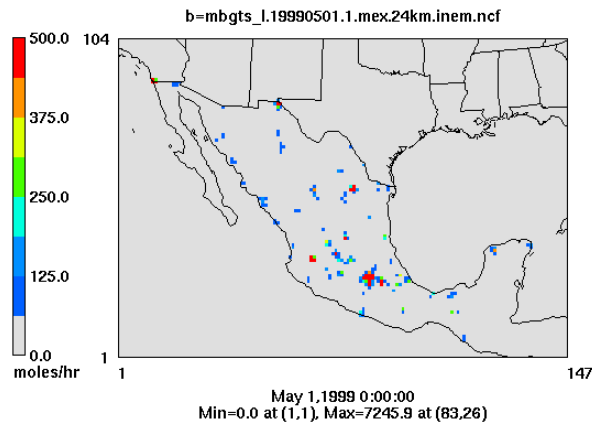
CO All Sources



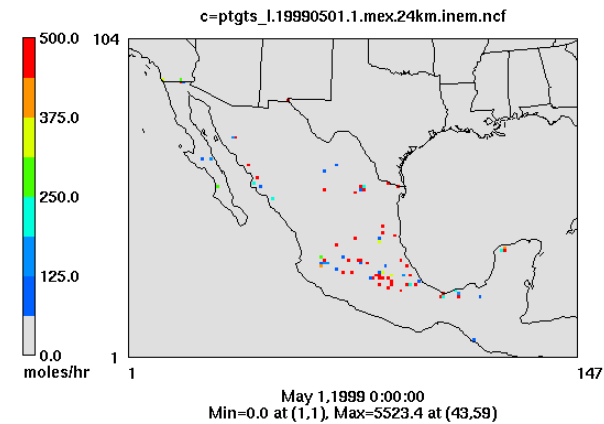
Note: Quality assurance in progress

Results: Preliminary SO₂ Spatial Emission Distribution

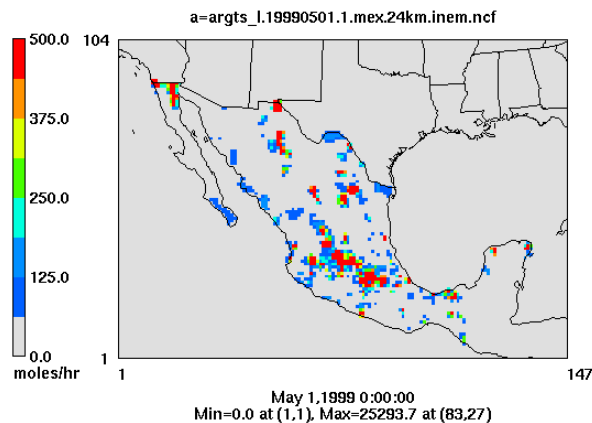
SO₂ Mobile Sources



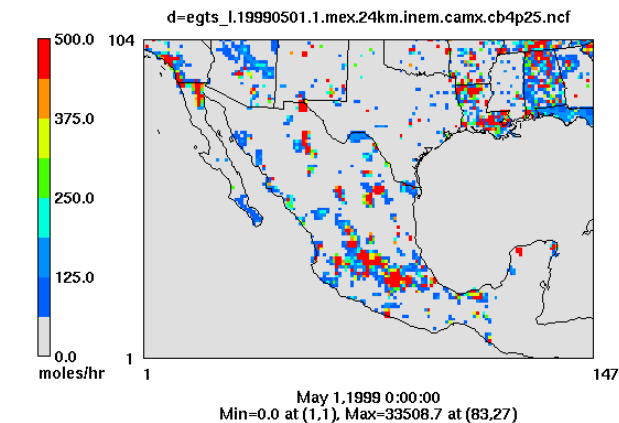
SO₂ Point Sources



SO₂ Area Sources



SO₂ All Sources



Note: Quality assurance in progress

Conclusions (1)

- ❑ Although these are a very preliminary results, they are crucial to set up the first ever regional air quality model simulations for Mexico.
- ❑ This work has been useful to develop institutional capacity at INE for emission processing and to apply AQM's.
- ❑ The surrogates created will be useful not only for INE's modeling effort but also for other national and international institutions.

Conclusions (2)

- ❑ The surrogates created in this work improve (in coverage and updating) previous efforts to develop the spatial allocation of Mexican emissions
- ❑ There are several modeling components in need of improvement
 - ❑ Temporal allocation
 - ❑ Chemical speciation
 - ❑ Point source locations
 - ❑ Point source stack parameters

For Further Information

Website:

<http://www.ine.gob.mx/dgicurg/>

E_mail:

Rodolfo Iniestra: riniestr@ine.gob.mx

Tania López: mtlopez@ine.gob.mx

David Parra: aparra@ine.gob.mx

