National Emissions Inventory 2016 for Air Quality Modeling

Dr. José Agustín García Reynoso, Lic. Pedro Cruz Santiago, Mtra. Dulce Herrera Moro, Mtra. Bertha Mar Morales and Dr. Luis Gerardo Ruiz Suarez

Instituto de Ciencias de la Atmósfera y Cambio Climático, UNAM

Air Quality Modeling Session

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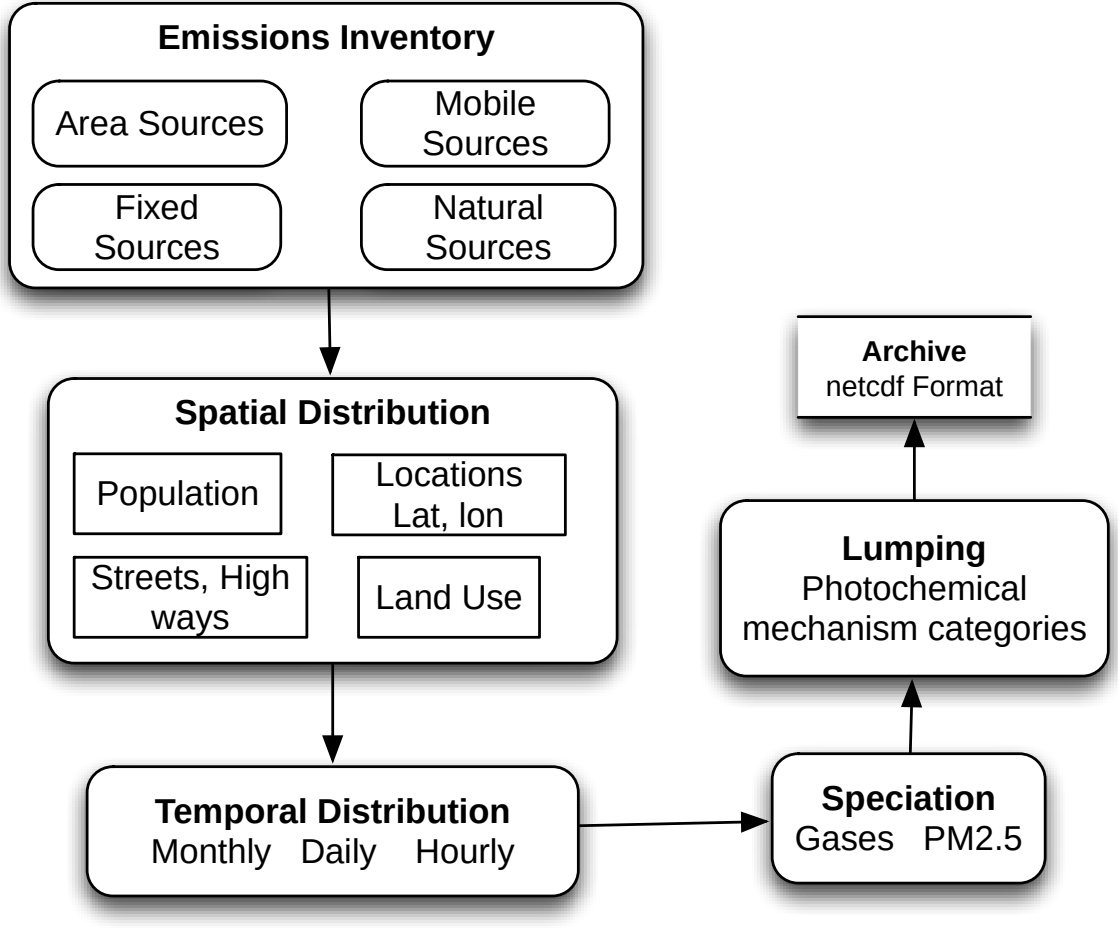
Background

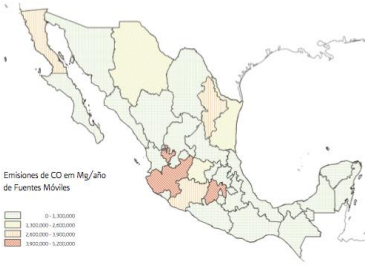
- Emissions inventories play a crucial role in the study of air quality in areas with pollution.
- There are annual emissions inventories available for specific years (NEIM **2006**, **2008, 2014, 2016**) compiled by SEMARNAT and INECC
- They lack certain characteristics required for use in air quality models. Specifically, these inventories lack the necessary features, such as hourly temporal distribution, data organized in a regular grid, and information on the chemical species necessary for the chemical mechanisms used in these models.
- Therefore, there is a need for a system to convert NEIM data into a format suitable for air quality modeling.

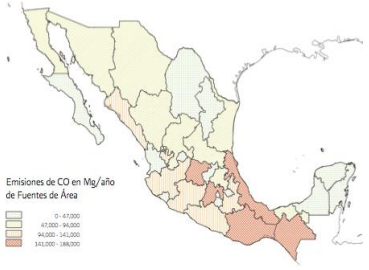
Emissions Inventory conversion

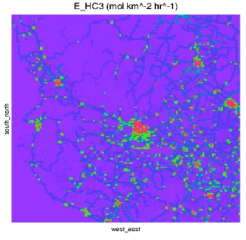


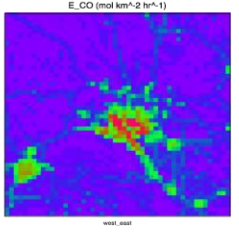
Procedure

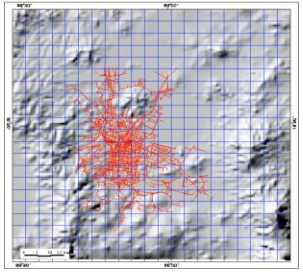
Emission Categories
78 point
59 area
15 mobile

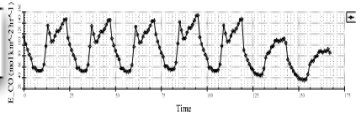




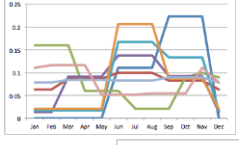


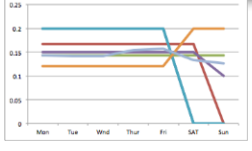


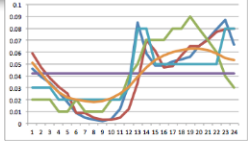




Profile	Code	CH4	ETH	HC3	HC5	HC8	OL2	OLT	OLI	TOL
31	43115	0	0	0	0.03	0.1	0	0	0	0
31	43212	0	0	0.14	0	0	0	0	0	0
31	43105	0	0	0.02	0.1	0	0	0	0	0
31	43220	0	0	0	0.1	0	0	0	0	0
31	43231	0	0	0	0.1	0	0	0	0	0
31	43122	0	0	0	0.1	0	0	0	0	0
31	43204	0	0	0.03	0	0	0	0	0	0
31	43116	0	0	0	0	0.05	0	0	0	0
31	43214	0	0	0.04	0	0	0	0	0	0
31	43201	0.03	0	0	0	0	0	0	0	0
31	45201	0	0	0	0	0	0	0	0	0.01
31	43202	0	0.02	0	0	0	0	0	0	0





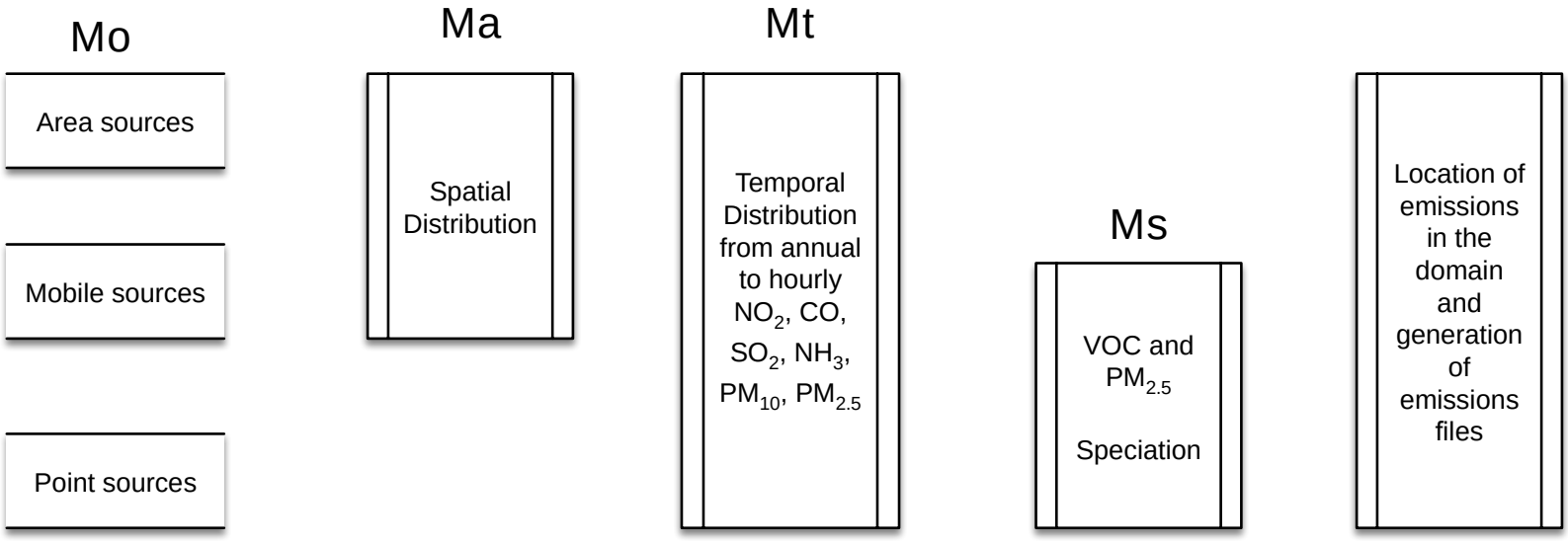


Perfil	Nombre Perfil	Especie	PDA	PEC	GSO4	PNO3	OTHER
22001	Coal Combustion	pm2.5	0.0107	0.0183	0.1190	0.0000	0.8520
22002	Residual Oil Combustion	pm2.5	0.1075	0.0689	0.5504	0.0005	0.2547
22003	Distillate Oil Combustion	pm2.5	0.0304	0.0770	0.3217	0.0024	0.5685
22004	Natural Gas Combustion	pm2.5	0.0000	0.0000	0.2090	0.0055	0.1945
22005	Petroleum Heaters	pm2.5	0.0840	0.0000	0.4700	0.0055	0.4405
22006	Residential Heating	pm2.5	0.8642	0.0000	0.1089	0.0289	0.0000
22007	Liquid Waste Combustion	pm2.5	0.0540	0.1050	0.0680	0.0000	0.7730

In collaboration with JAICA

Ancillary data from SMOKE

Mass balance verification



Mass conservation if Mo=Ma=Mt=Ms
In the spatial distribution, there were emissions that were not located due to the lack of agricultural land cover (3%).

Mass balance variation in Speciation

		Mobile	Point	Area
Mg/day	TOC (Mg/day)	1436	181	9056
CB05	Speciation	4398	457	27160
	% Diference	206%	153%	200%
MOZART	Speciation	1214	95	5395
	% Diference	-15%	-47%	-40%
RACM2	Speciation	1214	155	1104
	% Diference	-15%	-15%	-8%
RADM2	Speciation	1156	142	8220
	% Diference	-19%	-22%	-9%
SAPRC99	Speciation	1216	172	8570
	% Diference	-15%	-5%	-5%

In speciation: Diferences are due to non volatile and non reactive compounds

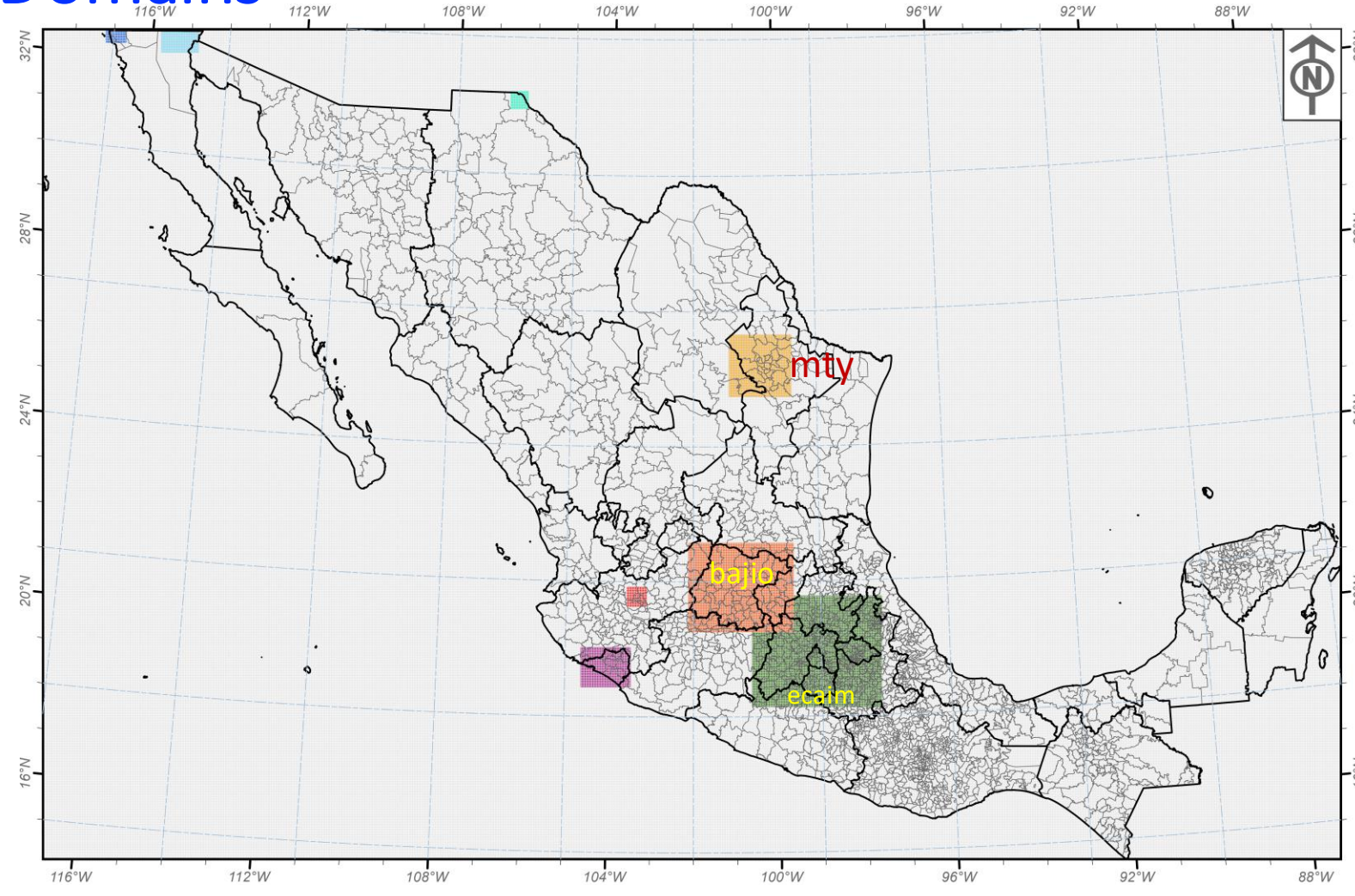
TOC > VOC

Results

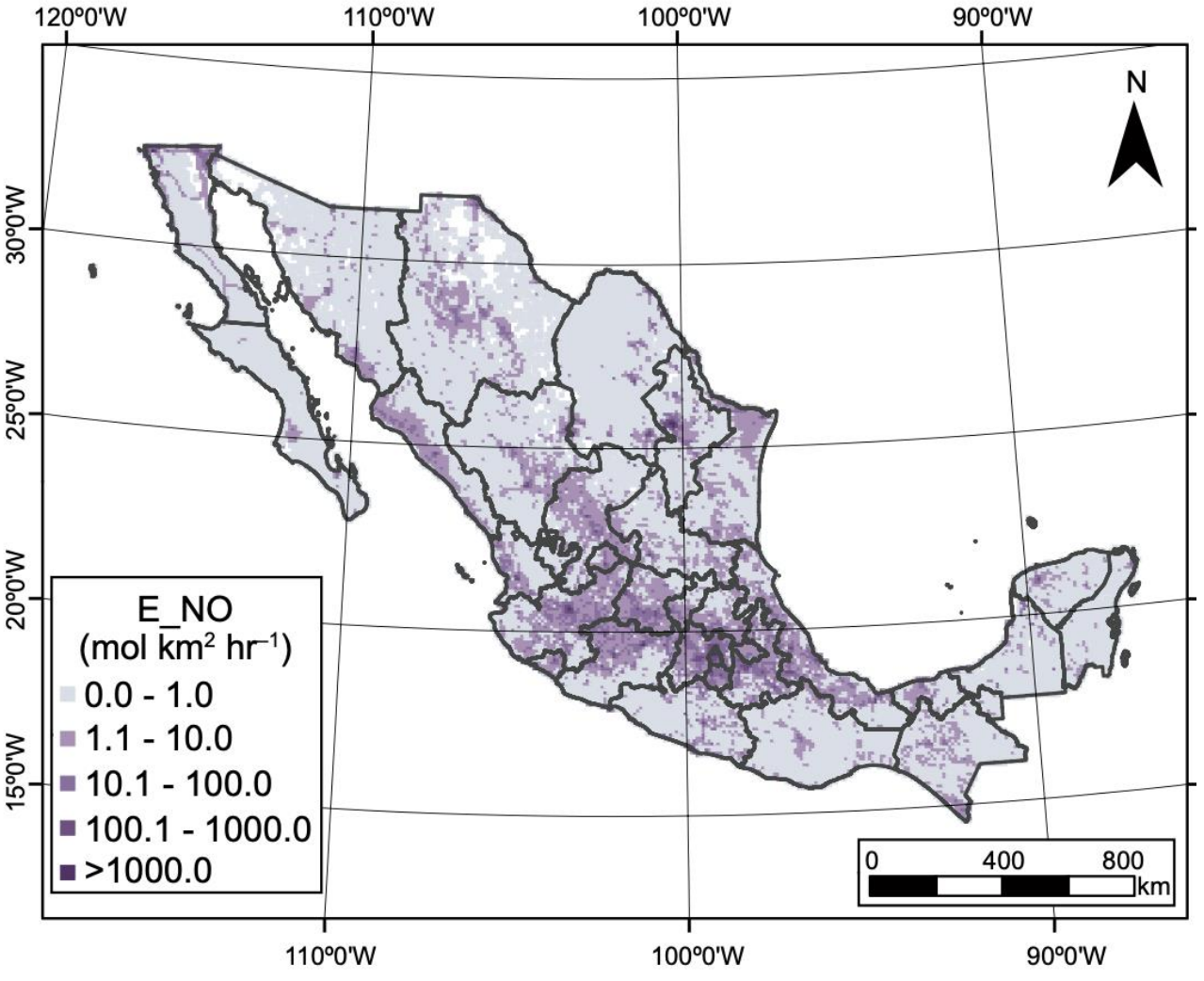
National Emissions Inventory 2016 is converted in order to be used in air quality modeling.

9 km	3 km	1 km	Description
Mexico9	Mexico3	--	Countrywide
	Jalisco	Guadalajara	State wide and City
	monterrey3	monterrey	Saltillo-Mty, Mty
	ecaim3	ecaim	Central Mexico
	bajio3	bajio	Guanajuato State
		Queretaro	Queretaro state
		cdjuarez	Juarez City, Chi
		Tijuana	Tijuana City, BC
		Mexicali	Mexicali City, BC
		Colima	Colima State

Domains

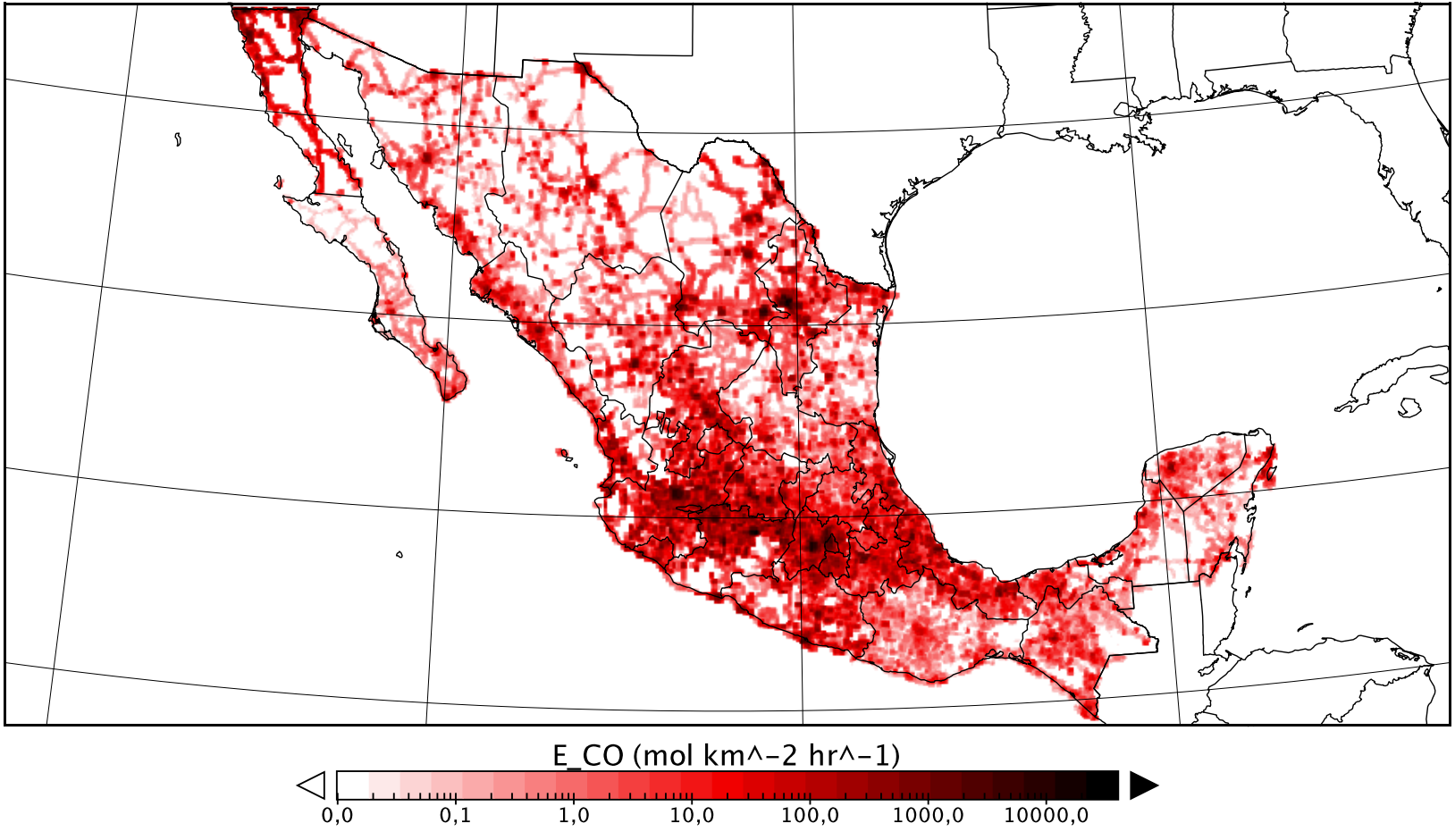

116°W
112°W
108°W
104°W
100°W
96°W
92°W
88°W
32°N
28°N
24°N
20°N
16°N
mty
bajio
ecaim

NO Results

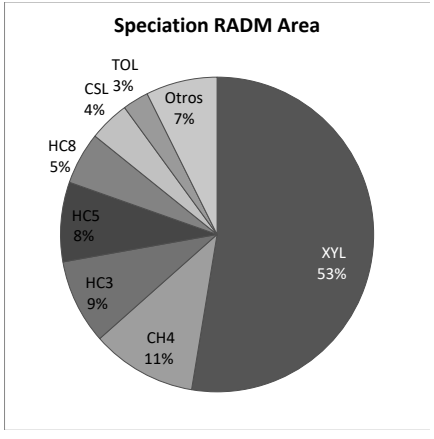


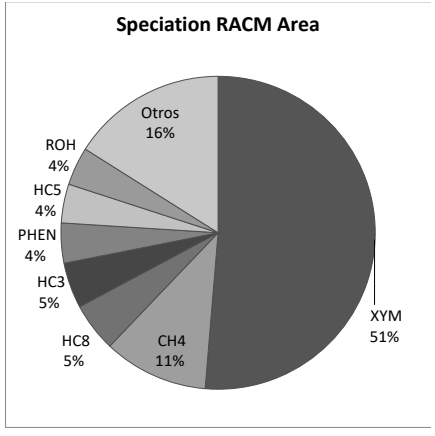
https://github.com/JoseAgustin/emis_2016

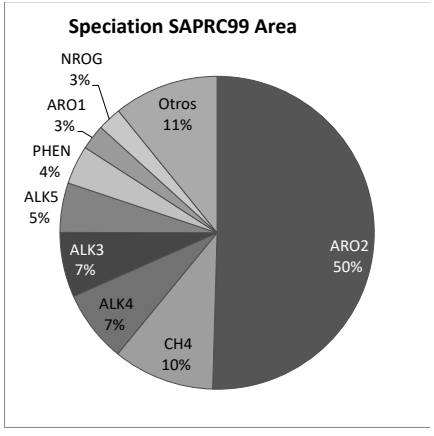
Carbon Monoxide Results

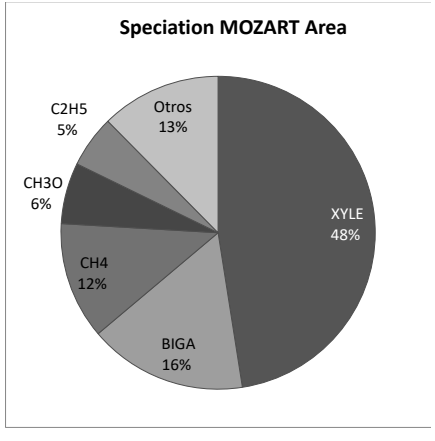


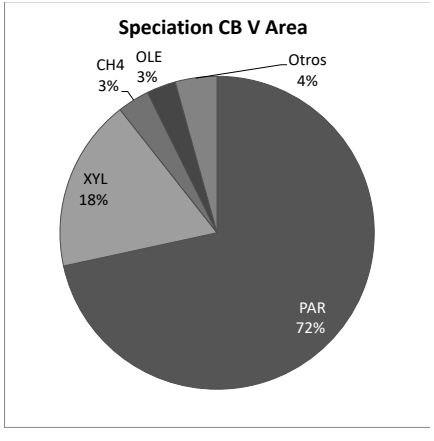
Speciation











Carter WPL (2000) Documentation of the SAPRC-99 chemical mechanism for VOC reactivity assessment vol 1. California Air Resources Board. Research Division, California, EU

Carter WPL (2015) Development of a database for chemical mechanism assignments for volatile organic emissions Journal of the Air and Waste Management Association 65:1171-1184 doi:10.1080/10962247.2015.1013646

Discussion

- Land cover, streets, highway and population were used for the spatial distribution.
  - Some grids near urban areas has no agricultural land cover therefore emissions were not allocated.
  - Mobile emissions are allocated by highway area surface
- Mexican emission categories were mapped to SCCs
- SCC were used for temporal profiles and chemical speciation.
- Speciation from Carter were used to lump chemical species into chemical mechanism.
- Different number of area emissions categories between 2014 and 2016.

Conclusions

- We have developed a system designed for the conversion of MNEI data
- There are 15 domains from national wide to some specific regions, grid sizes are from 9x9 to 1x1 km
- 6 different chemical mechanism are available and GHG
- NETCDF output files for WRF-chem, CMAQ and CHIMERE
- Code available from: https://github.com/JoseAgustin/emis_2016
- More detais in :DOI: 10.20937/RICA.2018.34.04.07

Nexsteps

- Conversion of the 2018 NEIM when available.
- Evaluation of 2018
- Development of emissions from evaporative area and point sources using temperature from the meteorological model.
- Inclusion of traffic activity in highways
- Obtaining local emission factors (i.e. combustion of LPG in homes)

Questions

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