



Evaluaton of the 2013 Mexico Emissions Inventory

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Background

- Air quality is a health issue, in urban cities like Mexico City
- In Mexico City in 2022 61% of the day above the standard
- Exposure reduction can be done by using air quality forecast
- A system for delivering air quality forecast was developed since 2006 (MM5+chem) an update in 2010 using WRF-chem central Mexico.
- Air quality forecast depends on meteorology, land cover, topography and emissions.
- In our case emissions has the largest uncertainties
- Identification and reduction of emissions uncertainty is required to generate a better description of the air quality in the region.

Methods

- 2 episodes with high ozone
 - March 2016 and May 2017
- Air quality measurements collection
- Using the original emissions inventory
- Comparison model vs observations 2017
 - Graphs and statistics
- Identification of scaling factors for NOx
- Identfication of scalinfg factors for VOC
- Scaling factor from 2017 applied in 2016 a modified emissions inventory is obtained
- Comparison 2016 model vs observations.



Scaling factor procedure



- NOx emissions scaling factor identification by comparing NOx concentrations from model and observations F_{NO}= NOx_{obs}/NOx_{model}
 VOC emissions scaling factor
 - 2) VOC emissions scaling factor identification by comparing O₃ concentrations model vs observed

Inventory scaling



RODRÍGUEZ ZAS, José Alejandro; GARCÍA REYNOSO, José Agustín. ACTUALIZACIÓN DEL INVENTARIO NACIONAL DE EMISIONES DE 2013 PARA LA MODELACIÓN DE LA CALIDAD DEL AIRE EN EL CENTRO DE MÉXICO. **Revista Internacional de Contaminación Ambiental**, [S.I.], v. 37, p. 463-487, aug. 2021. ISSN 01884999. Disponible en: <<u>https://www2.revistascca.unam.mx/rica/index.php/rica/article/view/RICA.53865</u>>. Fecha de acceso: 06 jan. 2022 doi:<u>http://dx.doi.org/10.20937/RICA.53865</u>.

Scaling factors for 2013 Mexico El

Pollutant	Area	Mobile	Point
NO	0.180	0.1	1.2
NO ₂	0.1	0.53	0.40
СО	2.6	0.5	0.5
SO ₂	1.25	0.5	0.4
VOC	2.5	2.5	2.5

More than 25 simulations to identify the scaling factors

Results 2017

120

100

80

60

88

Concentraciones





Blue model red observed

Fecha y hora

Scatter plots for ozone 2017



Results for ozone 2016



Conclusions

- It is shown that the original INEM-2013 is not adequate to describe the behavior of atmospheric pollutants in Central Mexico nor to carry out air quality modeling research in the area.
- The values of the calculated statistical metrics indicate that the numerical modeling with the original INEM-2013 differs considerably from the observations, especially in extreme values, with a tendency to underestimate the concentrations of CO and O₃ and overestimate NO₂, NO and SO₂, exceeding 700% for NO₂
- The INEM-2013 is optimized using a non-parametric methodology based on the calculation of scaling factors, obtaining an updated DB with which the results of the modeling with WRF-Chem are closer to the observations of the available stations.
- Based on the high computing capacity available, more than 25 numerical experiments could be carried out to obtain the best possible scaling factors, being validated in two different time periods.

Future work

 It is recommended to use the proposed methodology to identify the scaling factors on a seasonal basis and also obtain these for the spatial distribution within the study area, through the use of satellite observations, contributing to identifying the uncertainties in the emission inventories.