Interpretation of Atmospheric CO2 Measurements in Mexico City

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Outline

1. Background of the project
2. Methods
3. Model
    - Basic information
    - Emission inventories
    - boundary conditions
4. Comparison with observations

Background of the project

- Increasing CO2 emissions in Mexico City

Emissions (Mt/yr)

	CO_2 Mexico City		CO_2 eq MCMA	
	2014	***2016***	***2014***	***2016***
Point	1.534	1.076	9.254	9.547
Area	3.971	3.805	19.412	18.197
Mobile	13.298	16.116	27.510	34.571
Total	**18.803**	**20.996**	**56.176**	**62.315**

+25%

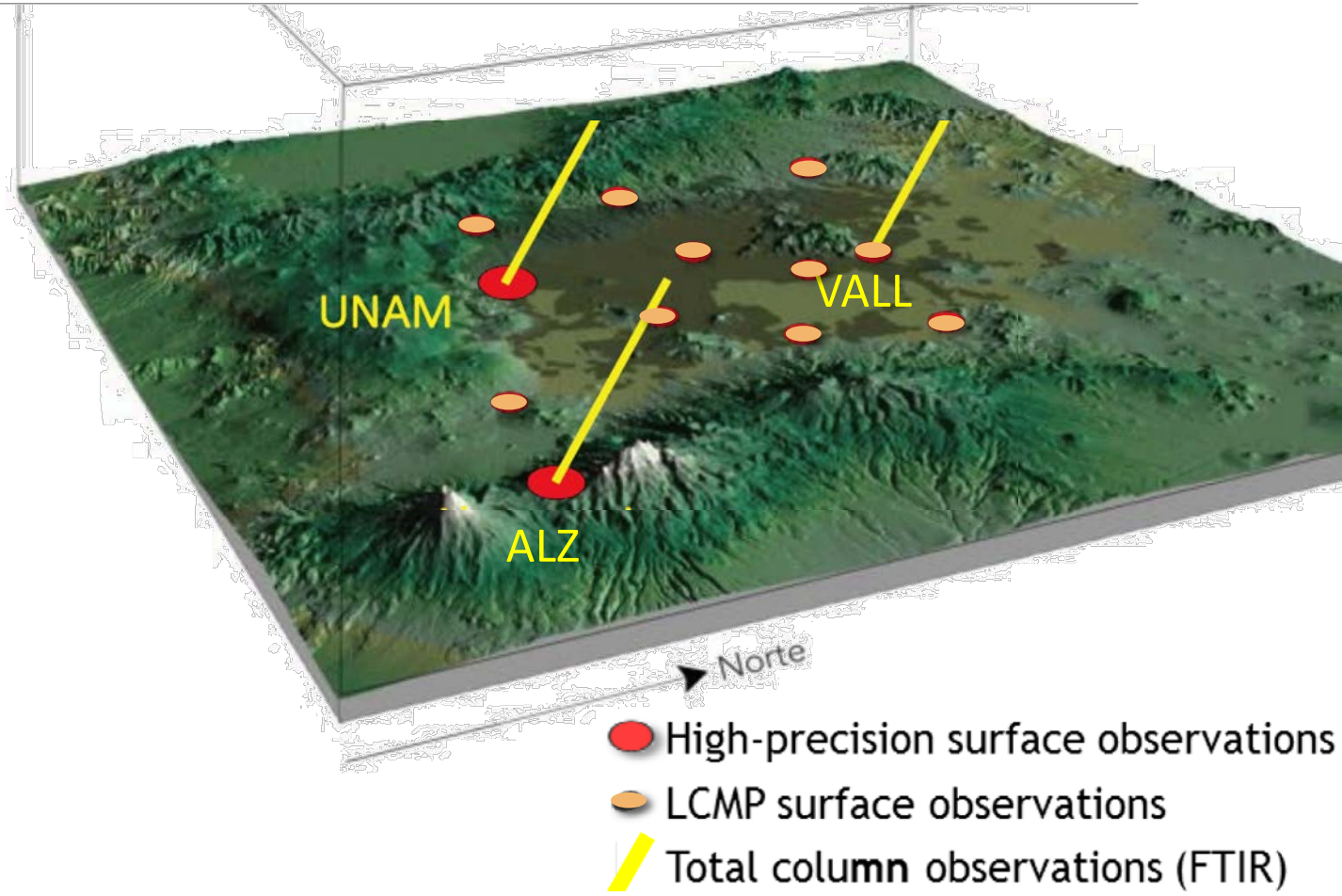
+11%

95.4% CO_2 3.5% CH_4 0.7% N_2O 0.4% HFC

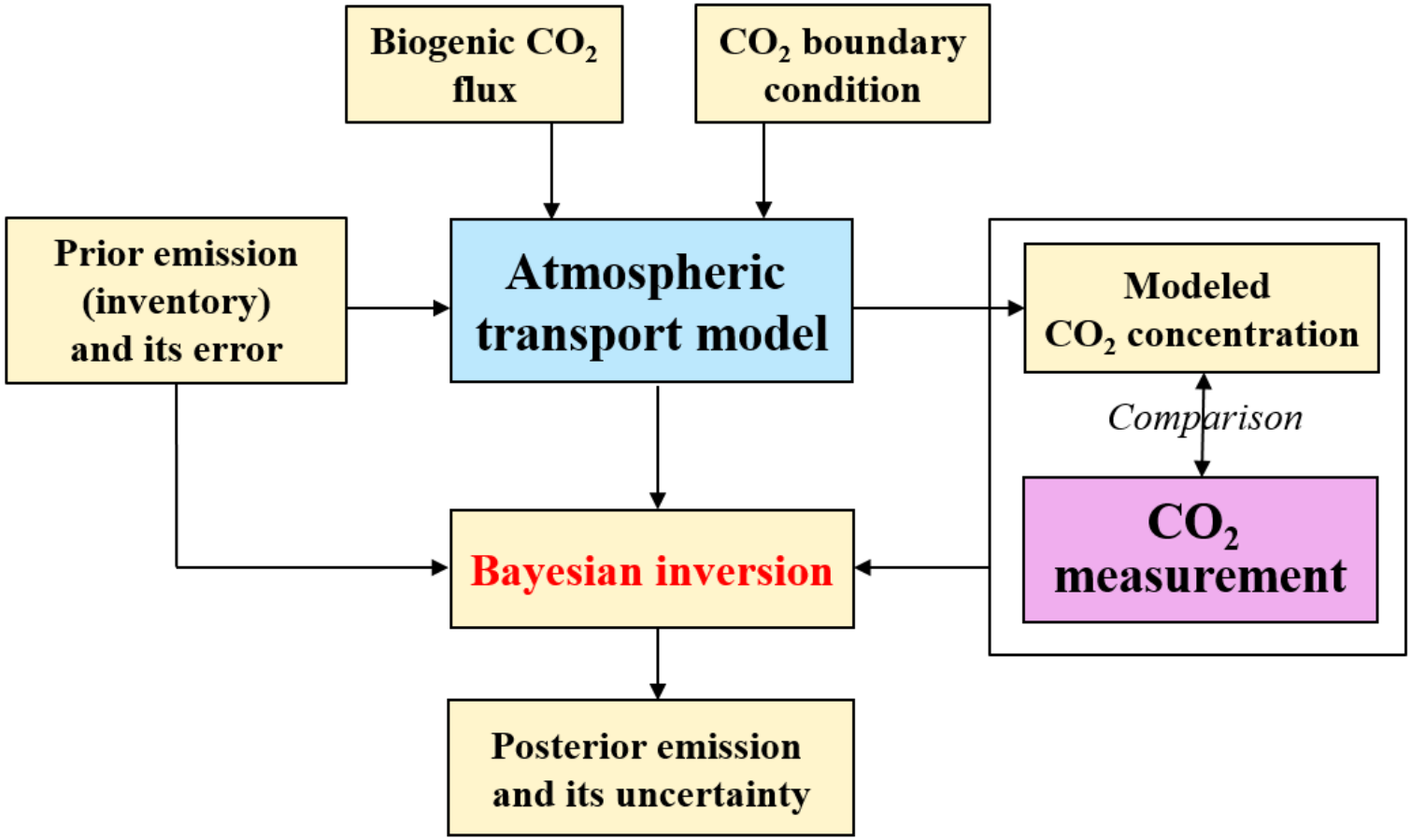


Background of the project

- MExico city's Regional Carbon Impacts (MERCI-CO2)
  - Measurement
    1. High-precision surface
    2. Low-cost medium-precision surface
    3. column
  - Transport model
  - Bayesian inversion

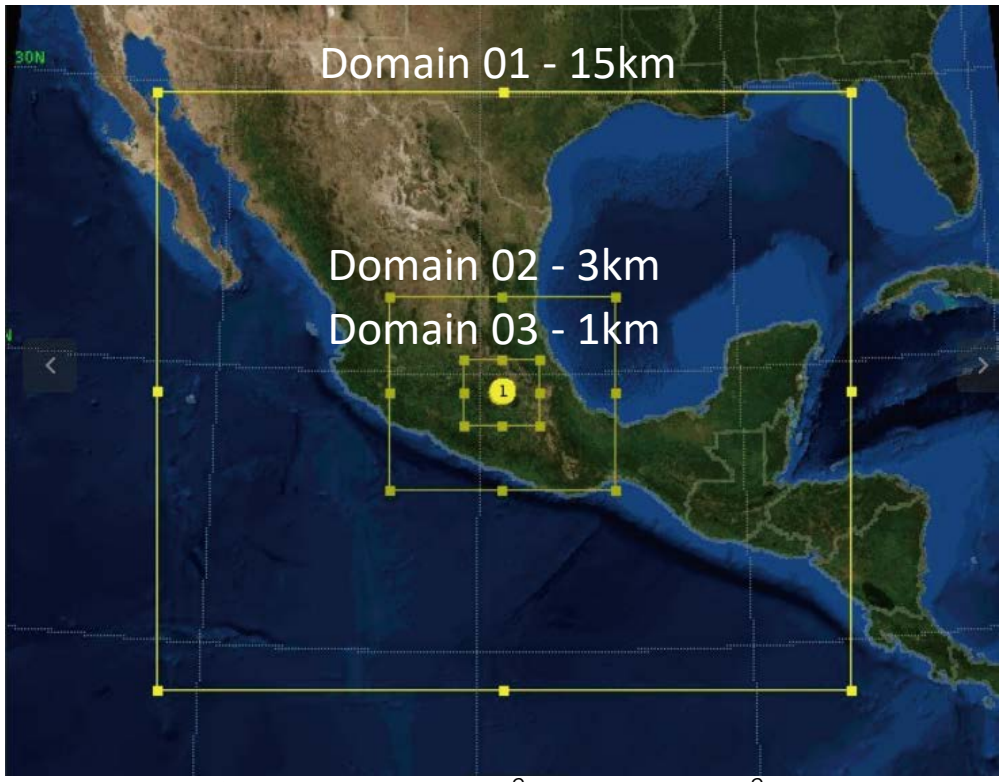


Methods: Inversion



Biogenic Source: CASA (Zhou et al., 2020)

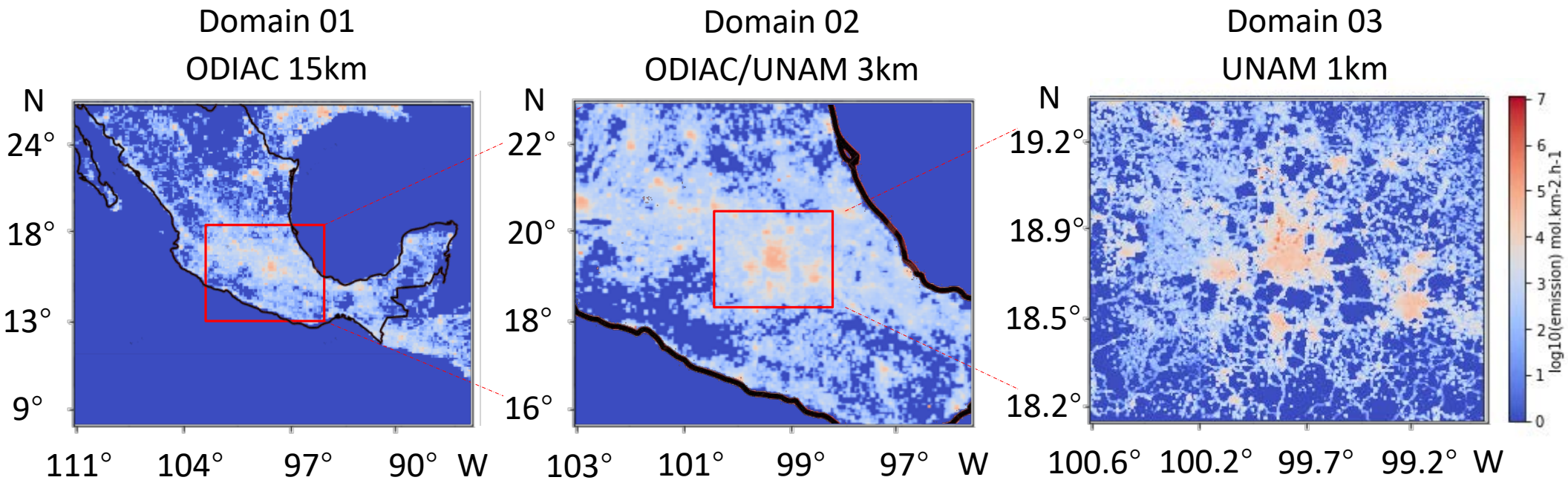
3-1 Basic infos of model



- Model: WRF-chem v4.0/3.9
- Drivers: ERA-Interim/ERA-5
- PBL Scheme:
  MYJ (1st run) / MYNN (2nd run)
- Urban Canopy: UCM
- Time: 2018/1/4 – 2018/1/18
- Resolution: 15/3/1 km

3-2 Emission Inventories

- Anthropogenic emissions

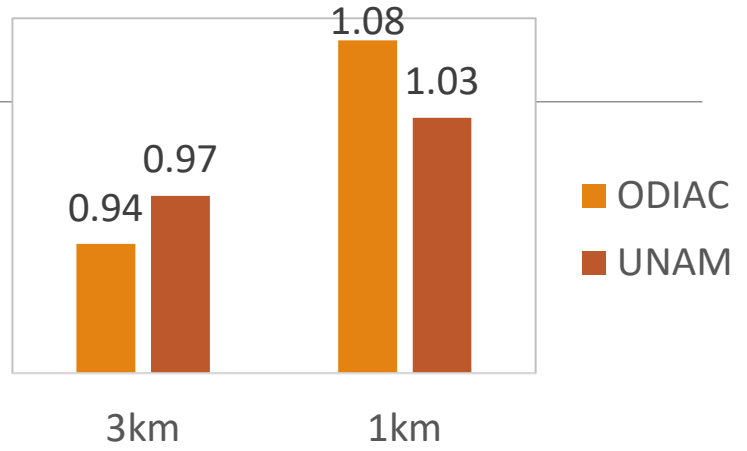


Source: UNAM 1-km inventory (Garcia), ODIAC (Oda et al., 2018)

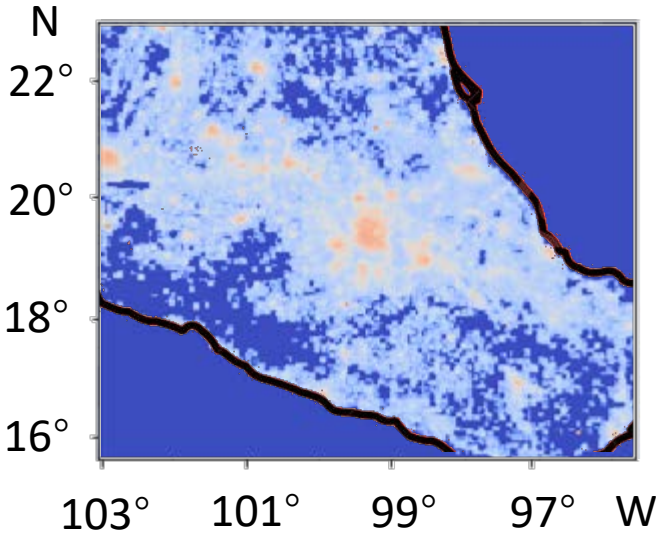
3-2 Emission Inventories

- Anthropogenic emissions comparison

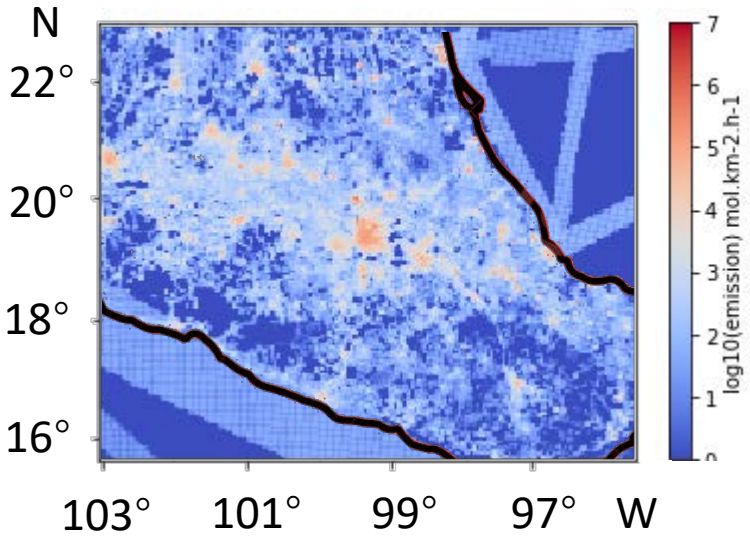
2018/1/4-2018/1/18 Total emissions: Mt



Domain 02
ODIAC 3km
2018/1/4 00:00:00

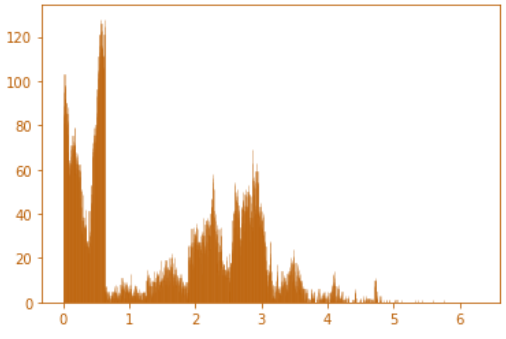


Domain 02
UNAM 3km
2018/1/4 00:00:00

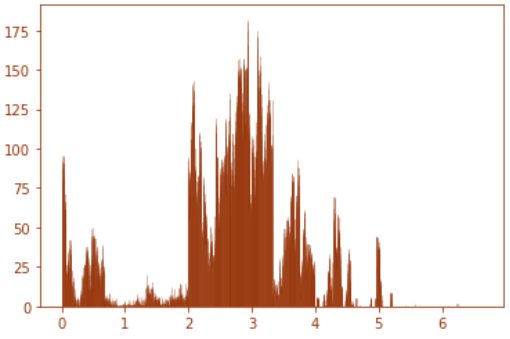


Log(emis) frequency distribution

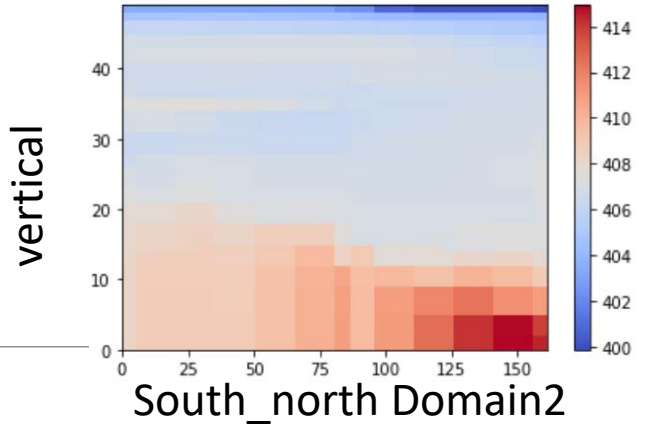
ODIAC 3km



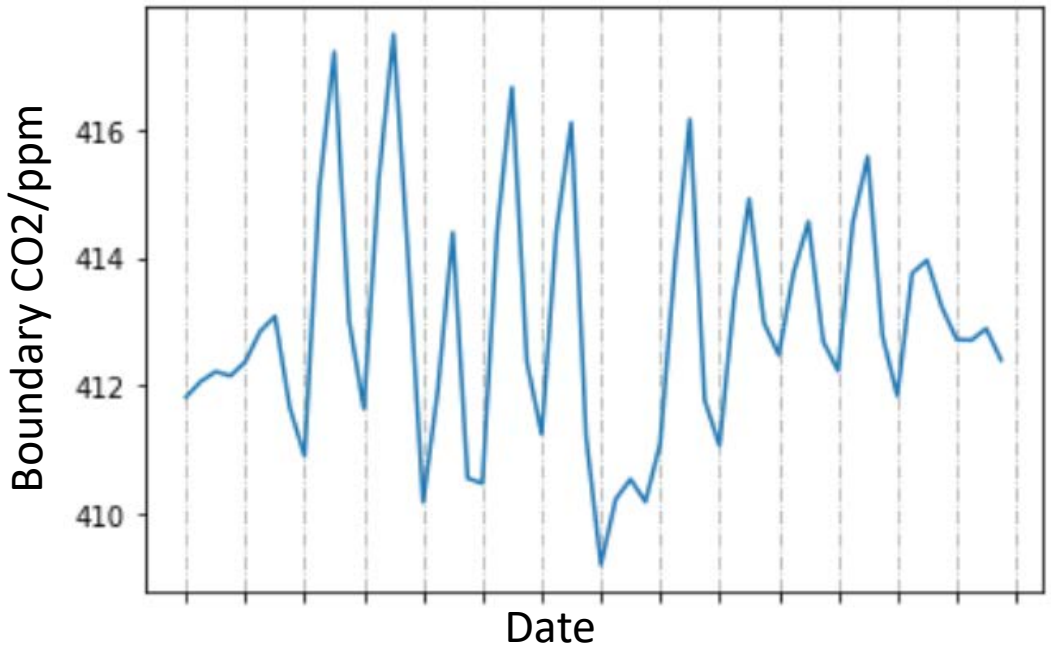
UNAM 3km



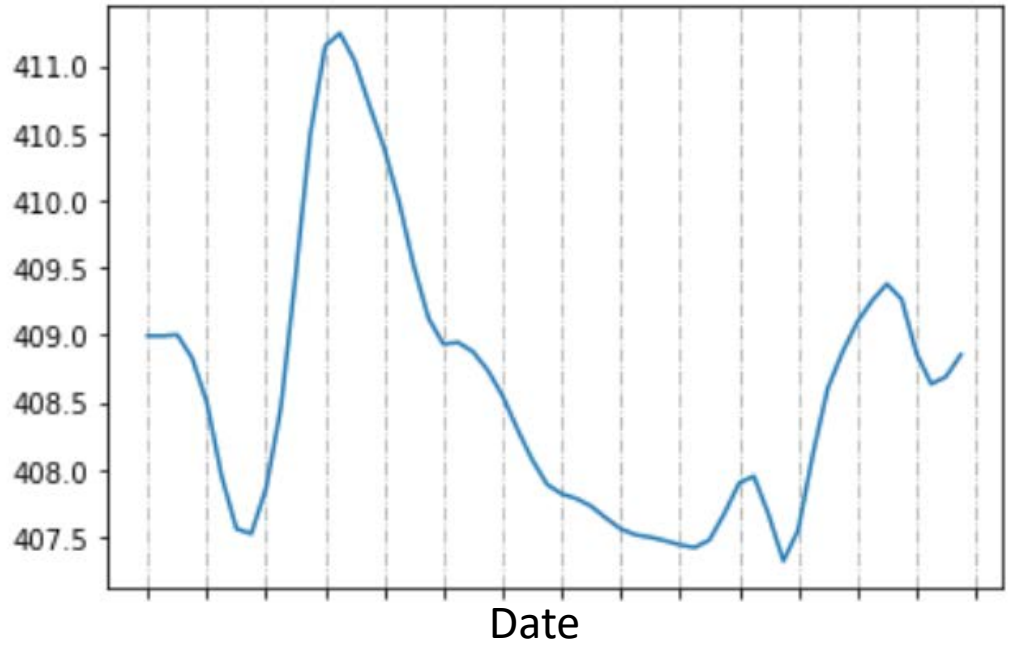
3-3 Boundary conditions



Boundary time series on the land



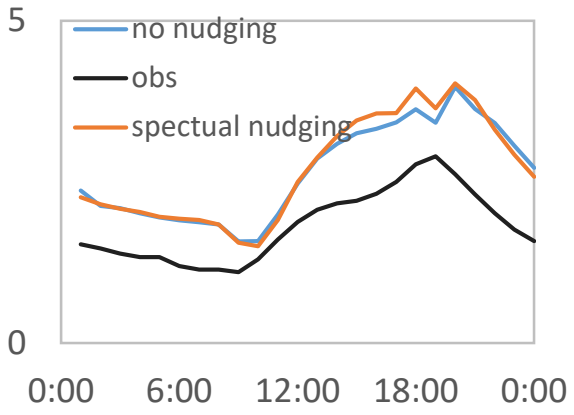
Boundary time series in the sea

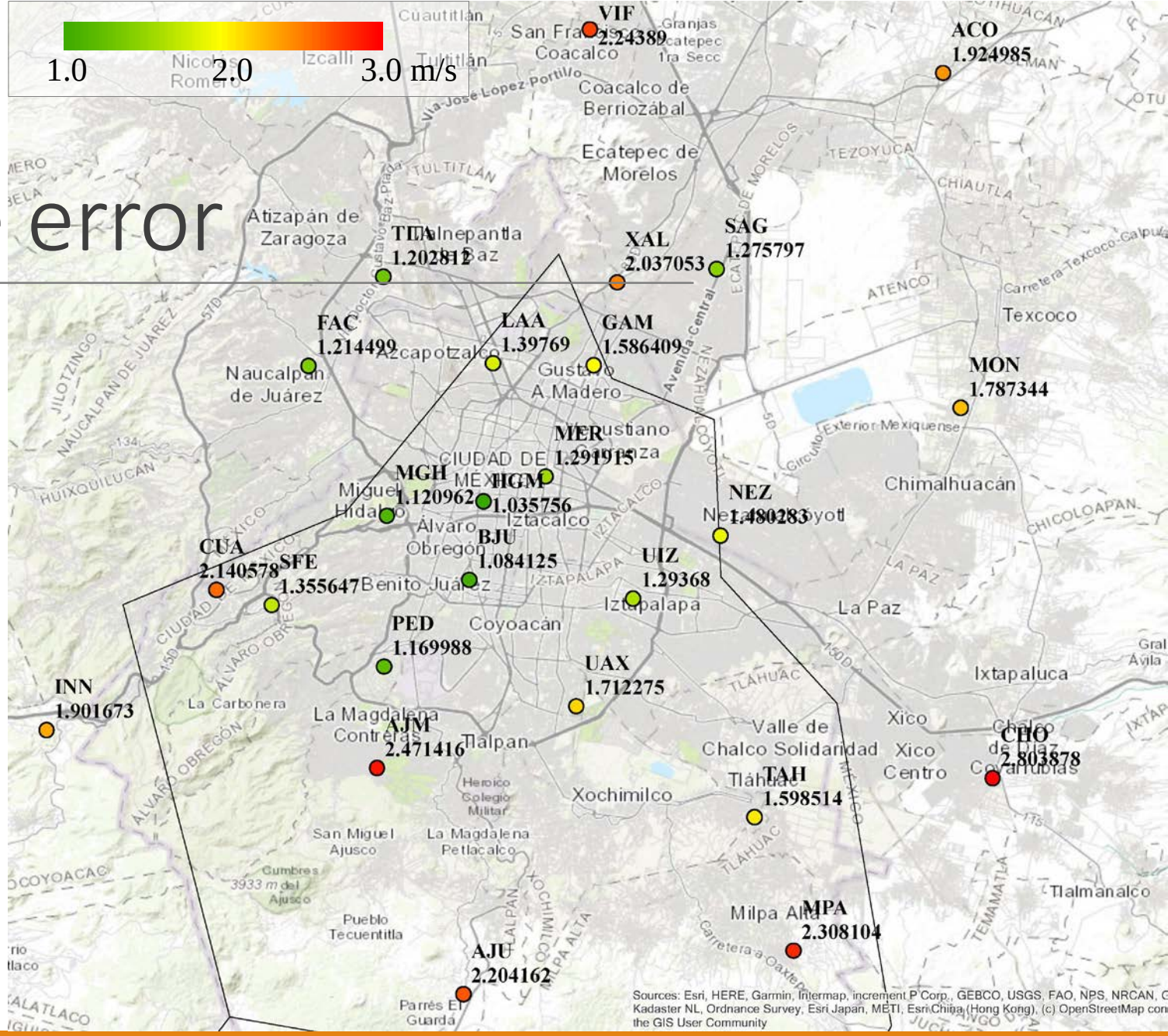


Source: CarbonTracker 2020 (Peters et al, 2007)

4-1 Wind speed - mean absolute error

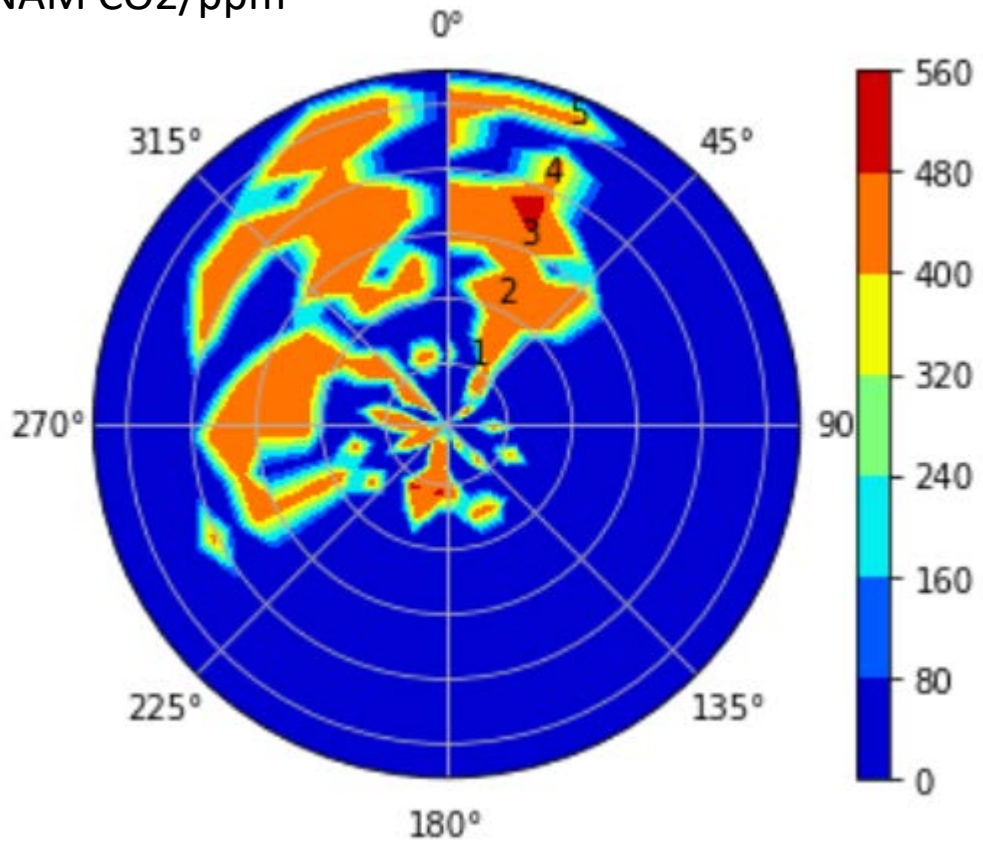
- How to: 9/26 Stations
- Variables: WS, WD, T
- Parameters: R2, MAE, …



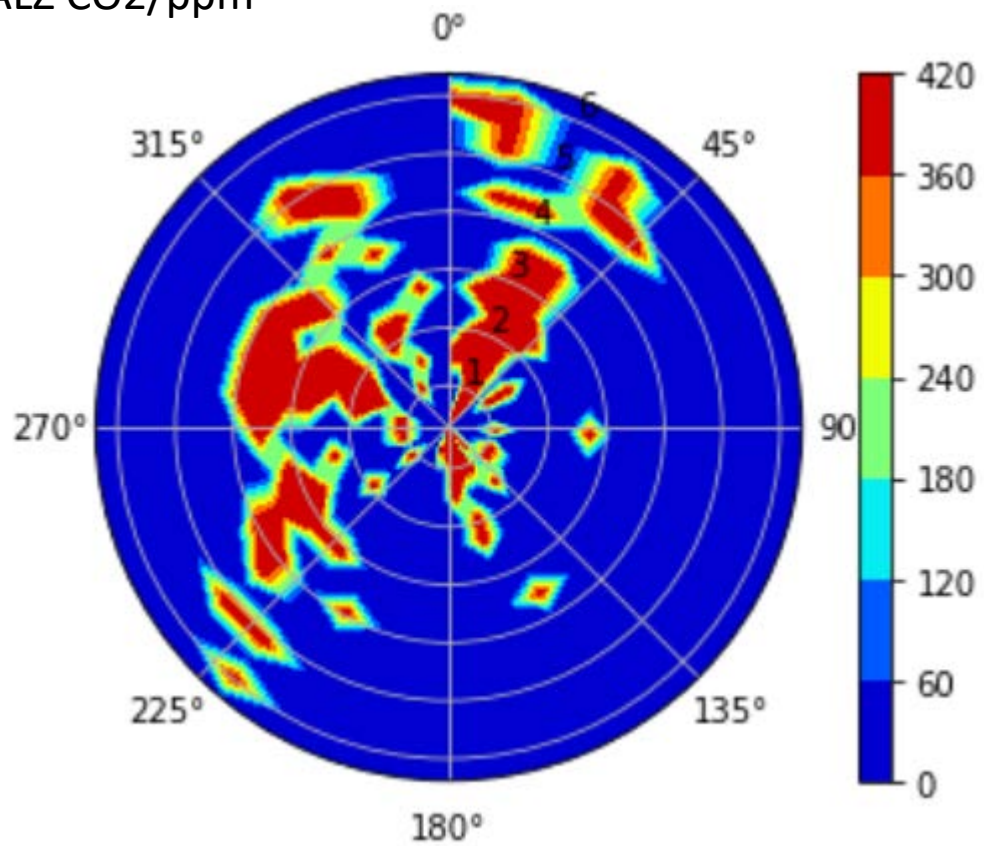


4-2 CO2 pollution rose

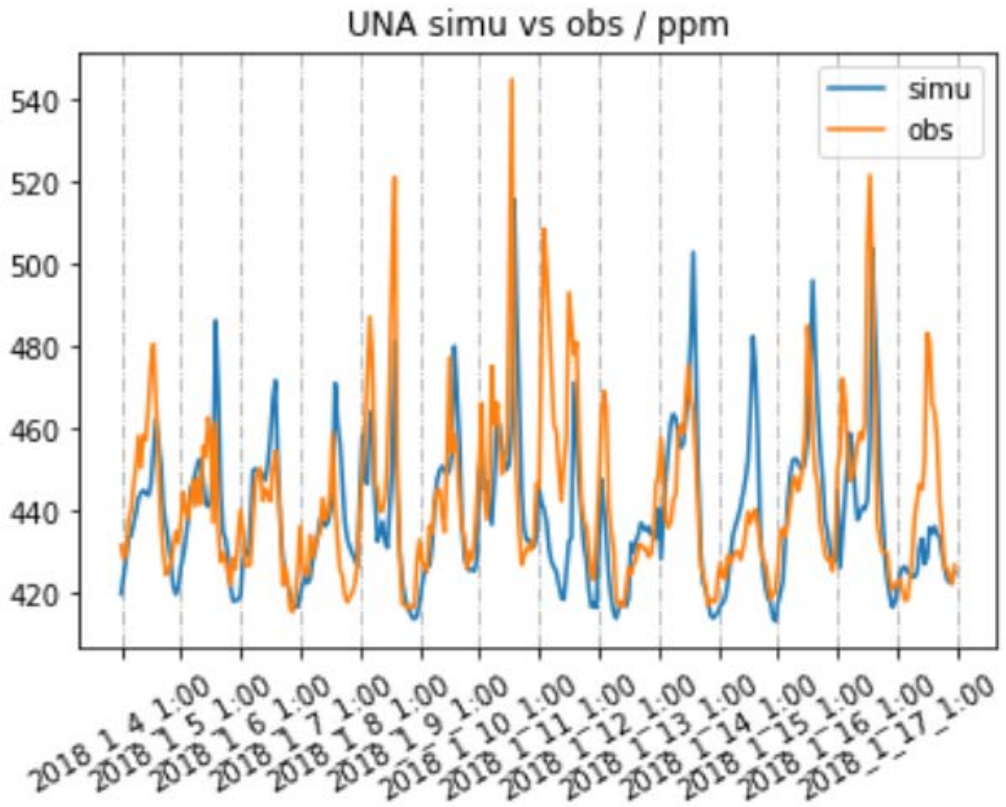
UNAM CO2/ppm

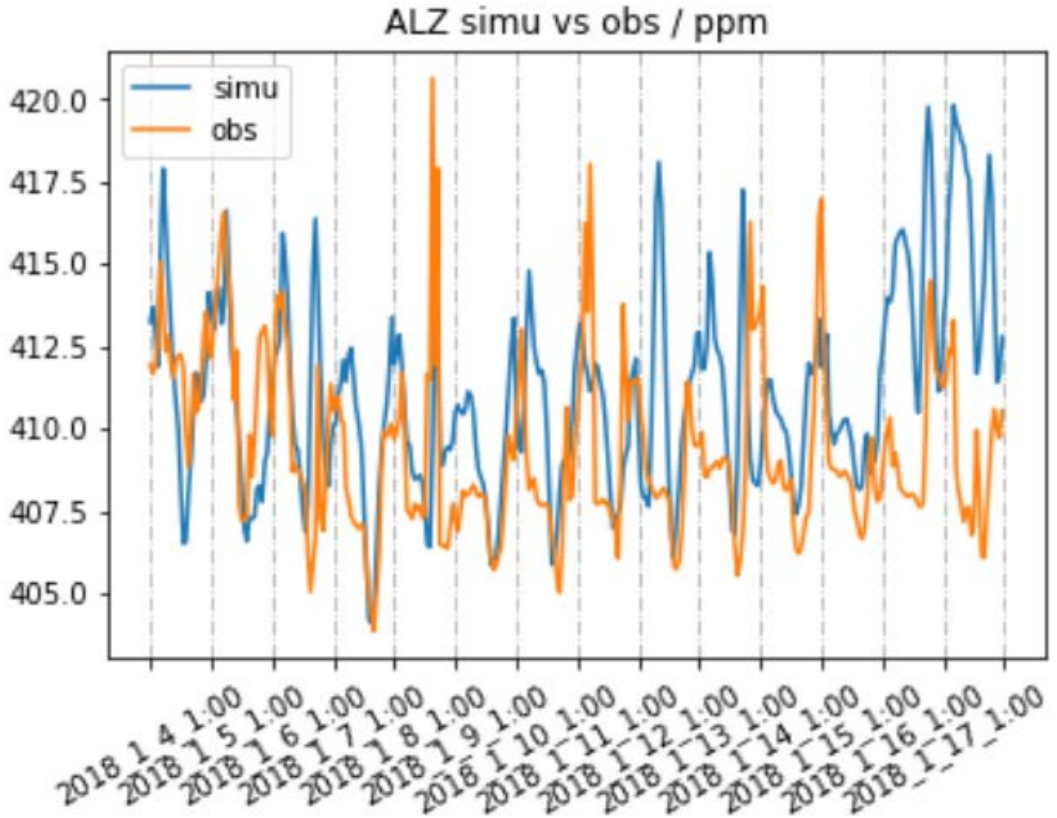


ALZ CO2/ppm

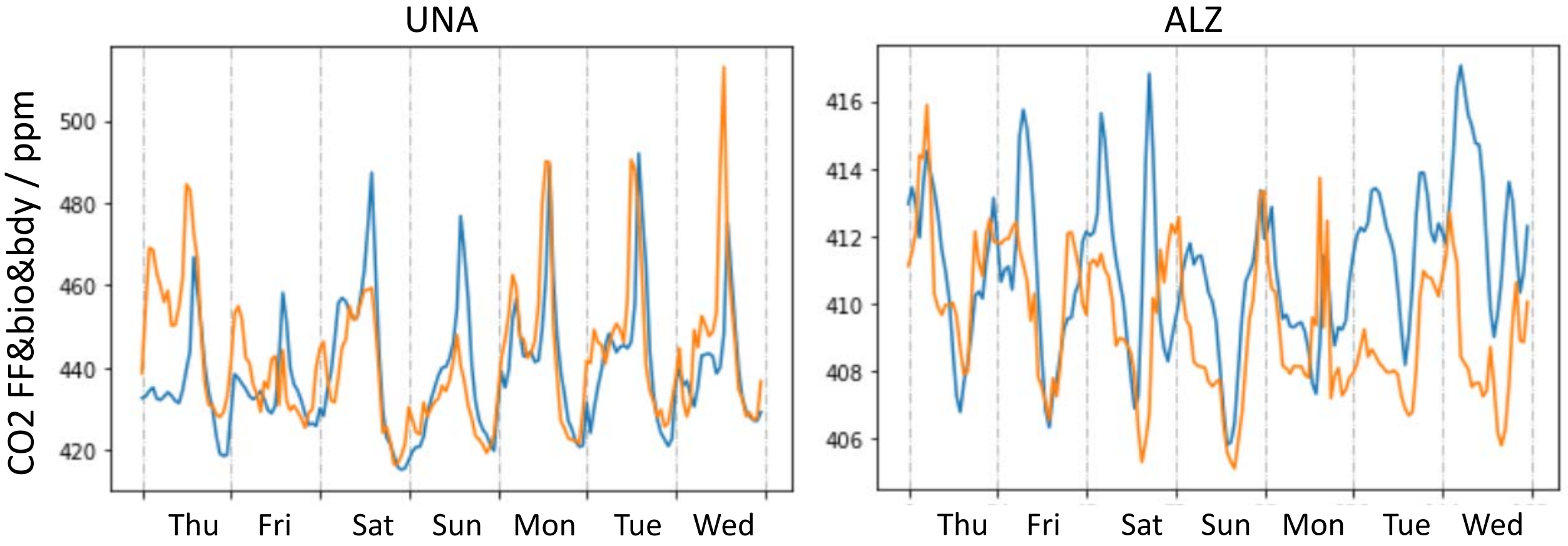


4-3 output – CO2 time series

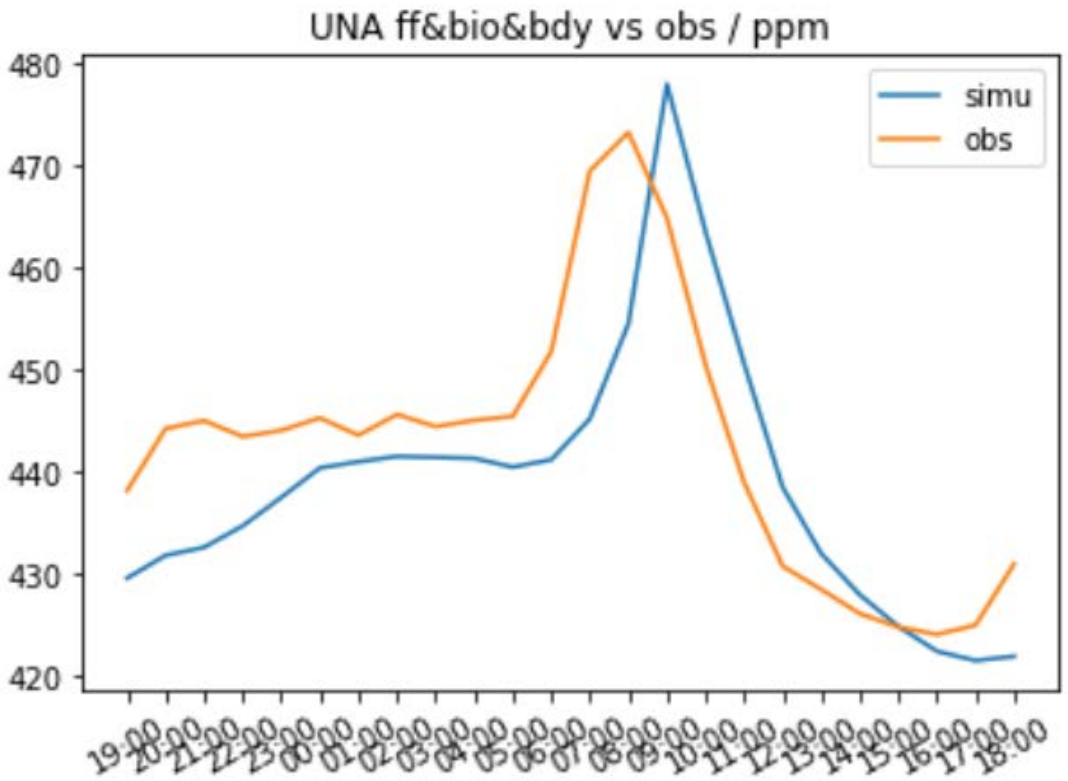


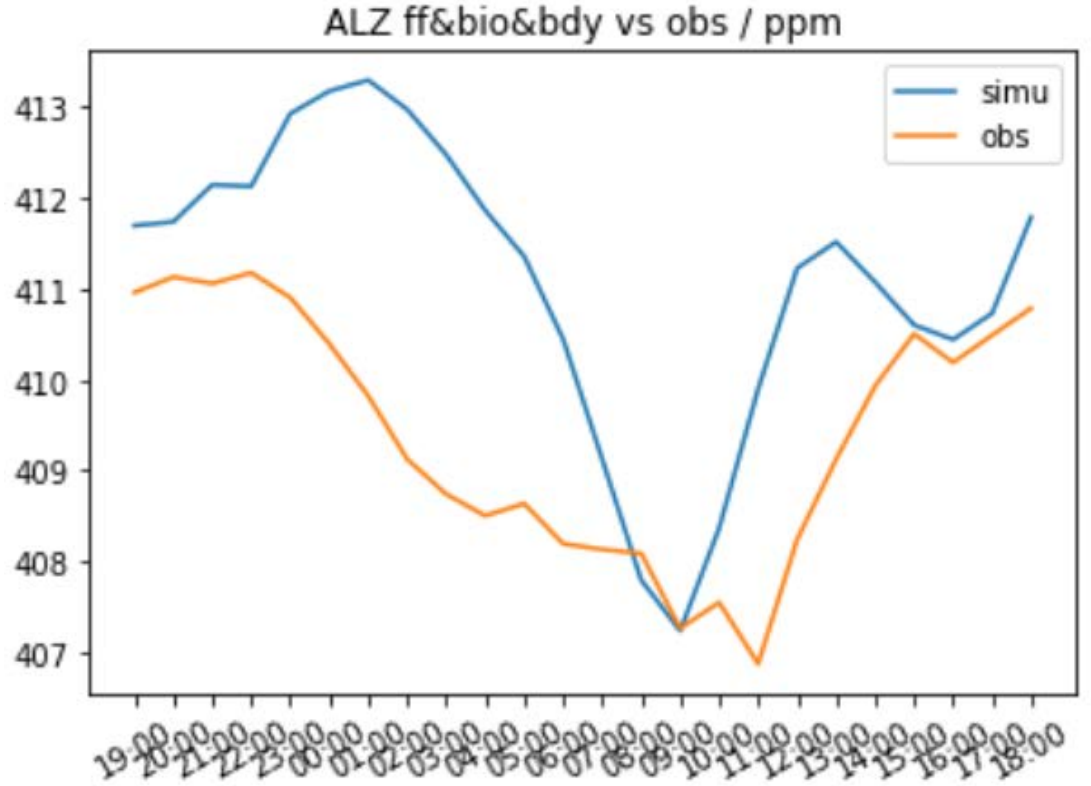


4-3 output – CO2 weekly cycle



4-3 output – CO2 daily cycle





4-3 output – Error

- PM better than AM
- UNA (Urban) varies more with less bias

