Ozone Modeling Platform Development: Status

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DFW Air Quality Technical Information Meeting
July 01, 2021

Topics

- Overview of Modeling Platform (MP)

- Modeling Domain

- Inputs Development

- Platform Setup

- Next Steps

MP Overview - Components

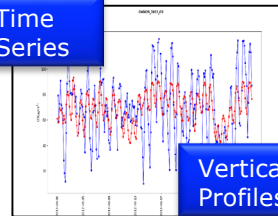**Episode**

April 1 – Oct 31, 2019

Air Quality Modeling Inputs

- **2019 Meteorology**
- **2019, 2023, 2026 Initial/Boundary Conditions**
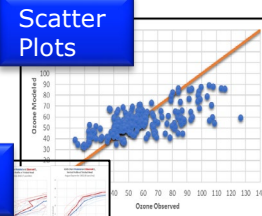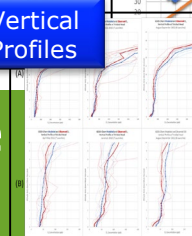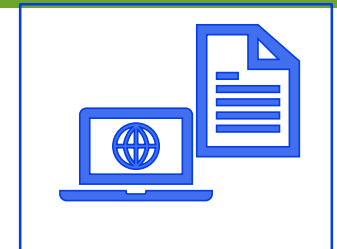- **2019, 2023, 2026 Modeling Emissions Inventories**

Domains

Legend
- 36 km North America
- 12 km Continental US
- 4 km Central and Eastern TX

Time Series

Scatter Plots

Vertical Profiles

Documentation

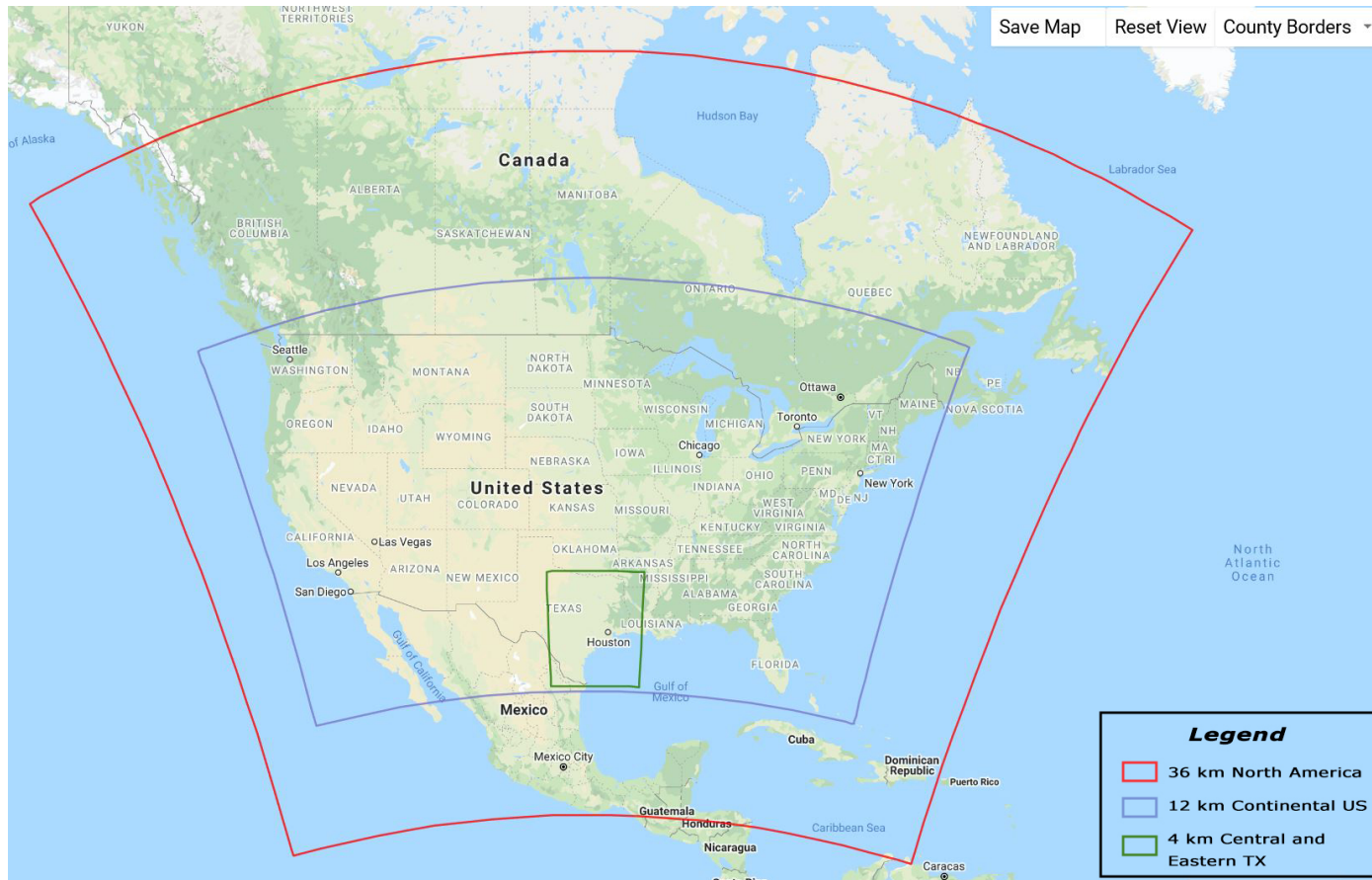**Model Performance Evaluation (MPE)**

MP Overview - Domain

Domains were determined based on potential applications.

- 36 km domain to cover all of Mexico and almost all of Canada
- 12 km domain now expanded to cover continental United States (CONUS)
- 4 km domain in central and eastern Texas expanded south to capture the full TX gulf coast

Emissions Inputs

Selection of data sets and models for various sectors:

Model Sector	Datasets/Model
EGU Points	2019 Air Market Program Data (AMPD)
TX Non-EGU Points	2019 State of Texas Air Reporting System (STARS)
Non-TX Non-EGU Points	EPA 2016v1 Modeling Platform
International EIs	2019 Community Emission Data System (CEDS); SMOKEv4.7_CEDS
TX Non-Point Oil & Gas	2019 Railroad Commission of Texas (RRC)
Non-TX Non-Point Oil & Gas	EPA 2017 Modeling Platform
Offshore/Gulf of Mexico	2017 Bureau of Ocean Energy Management (BOEM)
On-Road Mobile	MOVES3
Non-Road Mobile	TexN2.2 (TX); MOVES3 (non-TX)
TX Area	2017 Air Emissions Reporting Requirements (AERR)
Non-TX Area	EPA 2017 Modeling Platform
Shipping	2019 Automatic Identification System (AIS); MARINER v1
Biogenics	Biogenic Emissions Landuse Database (BELD5); BEIS v3.7 and SMOKEv4.8
Fires	2019 MODIS and VIIRS; FINN v2.2

Meteorology Inputs

- Weather Research and Forecasting (WRF), version 4.1.5

- 2019 MP WRF configuration:
  - Hybrid vertical coordinate system
  - Noah Land Surface Model (LSM)
  - Yonsei University (YSU) Planetary Boundary Layer (PBL)
  - Kain-Fritsch (KF) Cumulus

- Other Met configurations considered:
  - Pleim-Xu (PX) LSM, YSU PBL, with Multi-Scale KF Cumulus
  - Observational nudging with radar profiler data

Initial/Boundary Conditions Inputs

- Model used: GEOS-Chem v12.7.1

- Set up for 2019 Initial/Boundary Conditions (IC/BC):
  - Met: Modern-Era Retrospective analysis for Research and Application, Version 2 (MERRA-2)
  - Grid resolution: 2-degree by 2.5-degree grid
  - Chemistry scheme: tropospheric chemistry (trochem) with simplified secondary organic aerosols

- Anticipated future year IC/BC (2023 and 2026):
  - Emissions interpolated based on a moderate emissions from Representative Concentration Pathways (RCP4.5)
  - Regional scaling factors used for North America and China

Baseline vs. Base Case

- EPA guidance no longer recommends using a baseline emissions inventory for future year design value (DV_F) calculations.

- Comparison of previous baseline and base case model runs found only minor differences in DV_F.

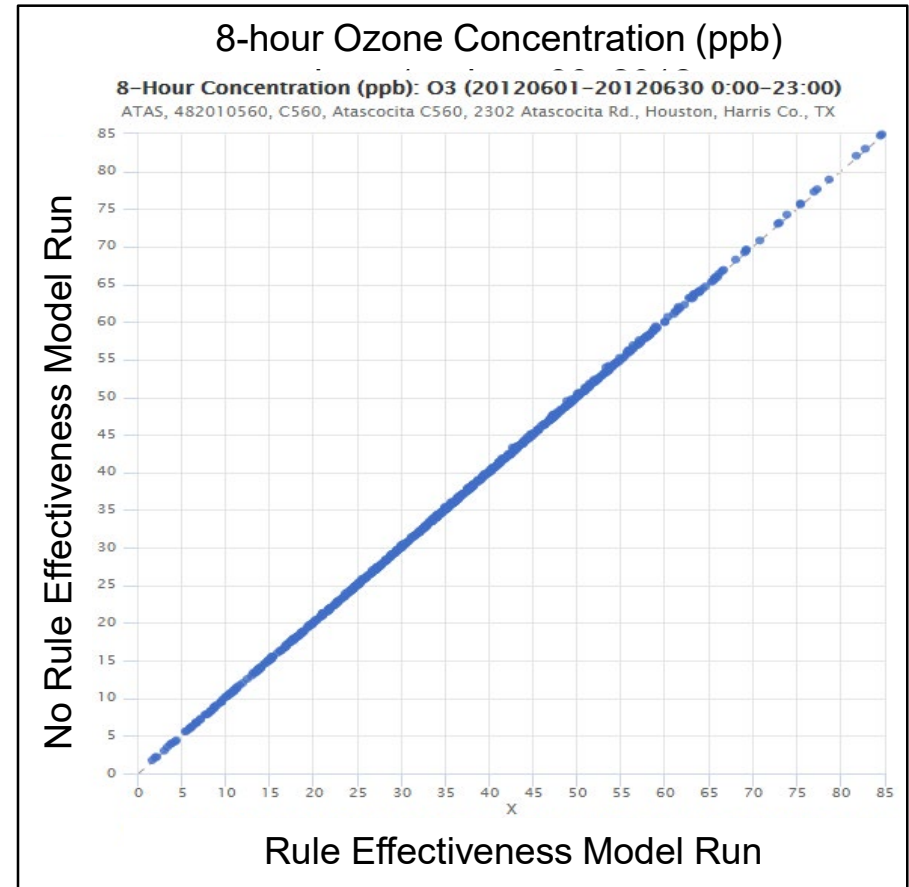| Nonattainment Area	Avg. DV_F Difference	Max DV_F Difference	Min DV_F Difference
DFW	0.450 (0.372)	1 (0.958)	0 (0.092)
HGB	0.225 (0.245)	1 (1.007)	0 (0.005)
SAN	0.546 (0.558)	2 (1.076)	0 (0.152)

Rounded (Unrounded) in parts per billion

Baseline will not be developed as part of the 2019 MP.

Rule Effectiveness (RE)

- Under RE, non-Electric Generating Unit (EGU) emissions are increased to reflect inefficiencies of new regulatory programs.

- There are no new regulations currently being phased in.

- RE is no longer used by others in the modeling community.

- Test shows that RE has no impact on model performance.

8-hour Ozone Concentration (ppb)

8–Hour Concentration (ppb): O3 (20120601–20120630 0:00–23:00)
ATAS, 482010560, C560, Atascocita C560, 2302 Atascocita Rd., Houston, Harris Co., TX

No Rule Effectiveness Model Run

Rule Effectiveness Model Run

RE will not be used in developing non-EGU emissions for the 2019 MP.

Photochemical Modeling

- Comprehensive Air Quality Model with Extensions (CAMx), version 7.1

- Tasks completed:

  - CAMx v7.1 compiled and ready to go

  - O3MAP program and Tropospheric Ultraviolet and Visible (TUV) processed to be compatible with CAMx v7.1 and CB6r5

- Several test runs for CAMx v7.1:

  - V7.0 vs. v7.1 using CB6r4

  - Binary vs. netcdf EI inputs

  - CB6r4 vs. CB6r5 with CAMx v7.1

Next Steps

- Finish base year emissions inventory (EI) and future year EI

- CAMx runs with appropriate EIs

- EI inputs available to the public in Fall of 2021

Questions?

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