MOVES2014 Emissions Using Day-Specific Hourly Meteorology Compared with Monthly Average Meteorology

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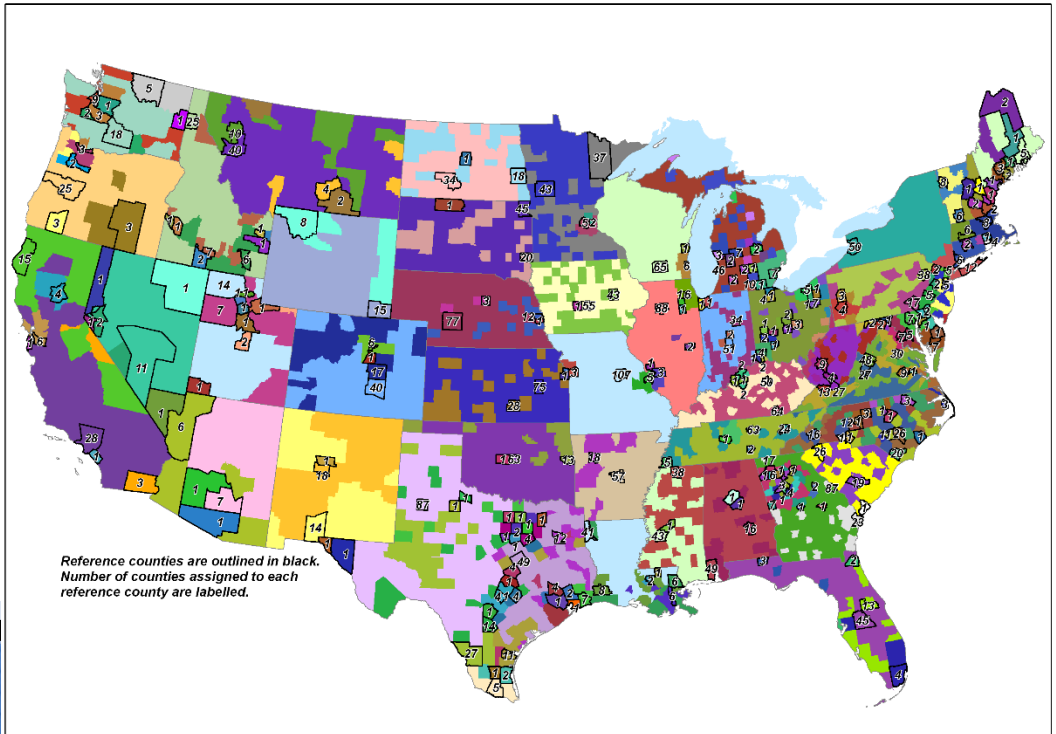
1. CSC; 2. EPA OTAQ; 3. EPA OAQPS and Region 1; 4. EPA OAQPS

Research question

- What is the impact of daily varying meteorology on MOVES based emissions?
  - Realistic meteorological inputs
  - Span scales: county -> “national”

Modeling Setup

- 2 National runs using SMOKE-MOVES
  - Use 284 representative counties
  - Run MOVES to produce emissions factors (EF)
- Use identical representative EF, county/grid activity, and ancillary files
- 2 different gridded meteorology data sets

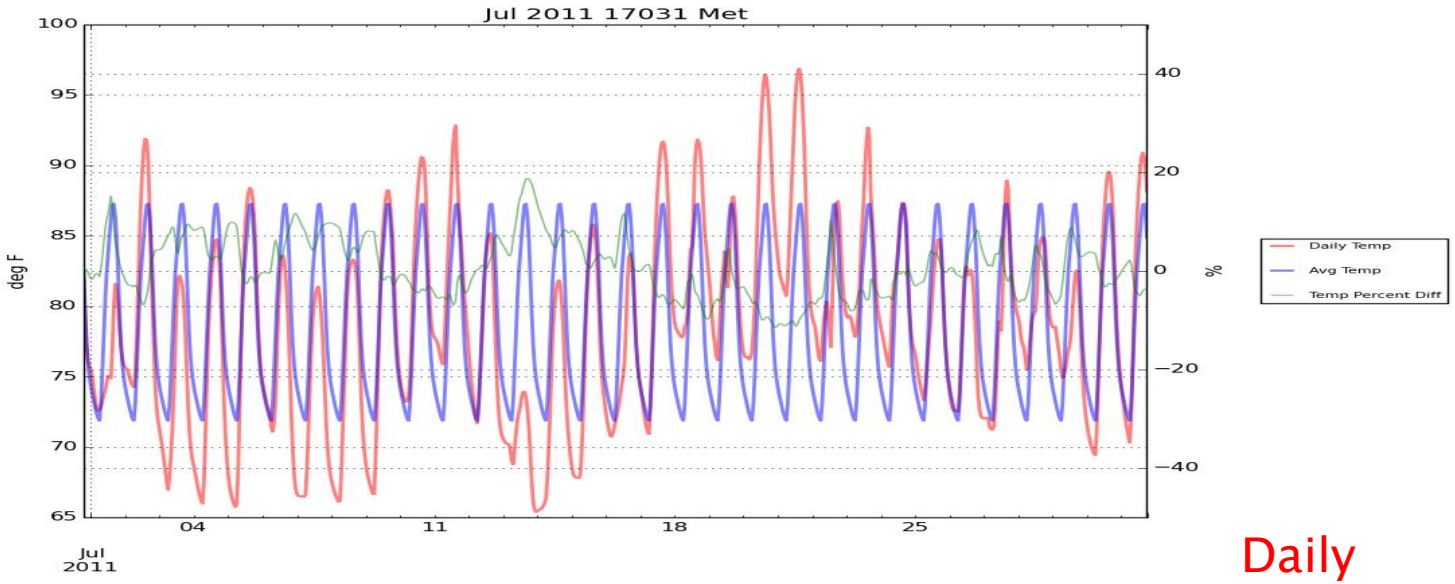


Meteorology

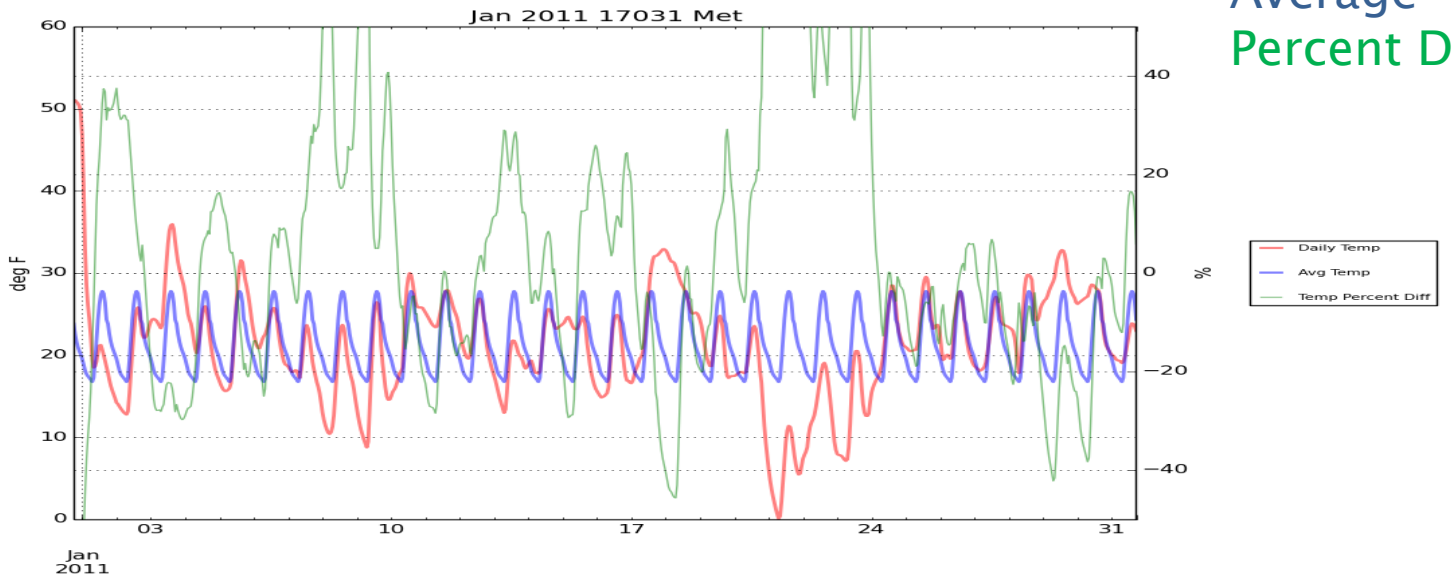
- Meteorology:
  - WRF run for 2011
  - Hourly data
  - 12km grid cells
- Scenarios:
  - “Daily”: meteorology varies by hour of the day and by day of the year
  - “Average”: meteorology varies by hour of the day and all days in a specific month are identical. Average meteorology is hour by hour average of the daily meteorology

Meteorology (1 of 4)

Cook, IL
July



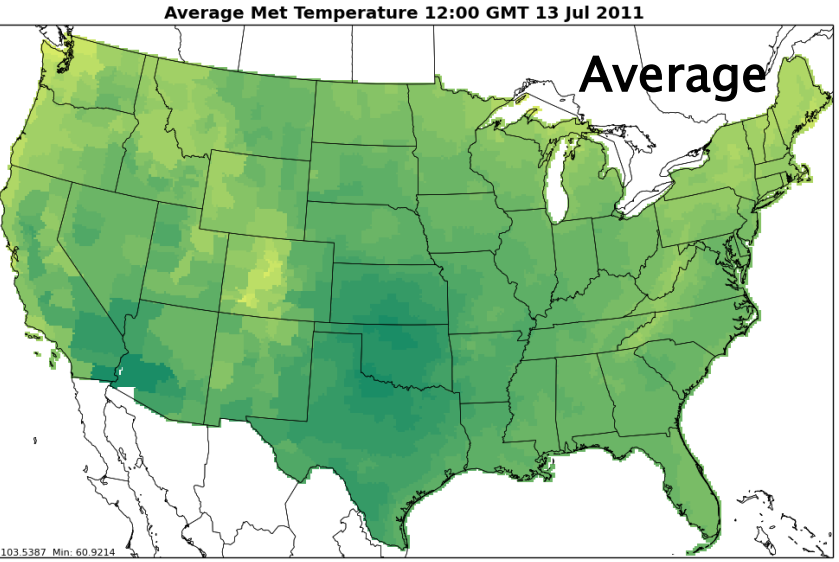
Cook, IL
January

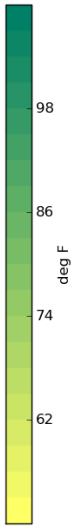


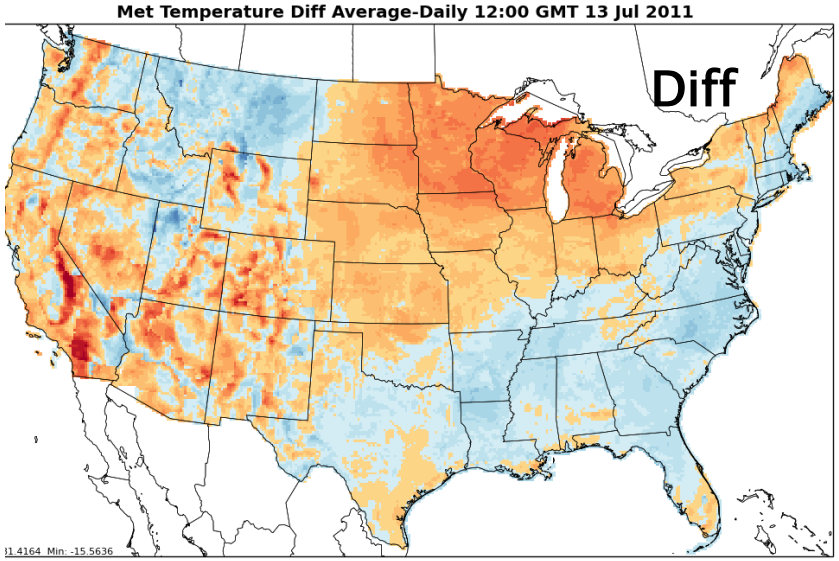
Daily
Average
Percent Diff

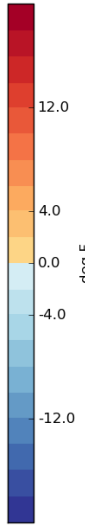
Meteorology (2 of 4)

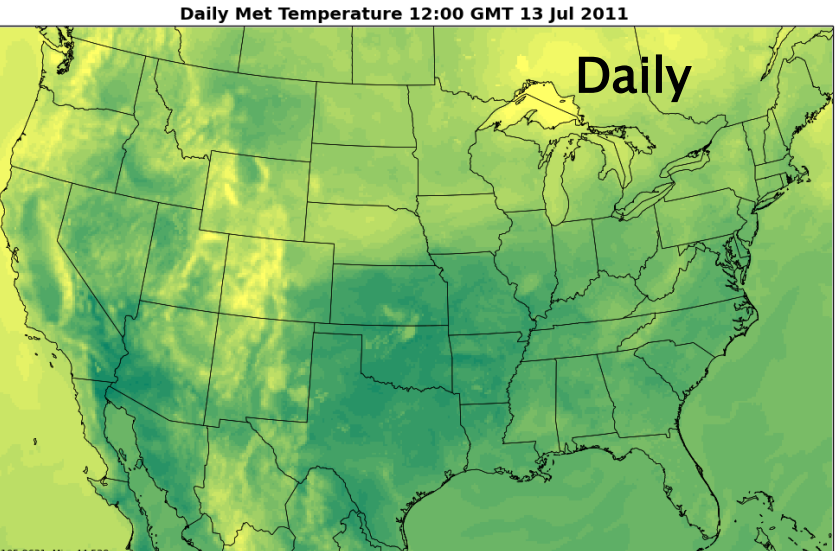
July

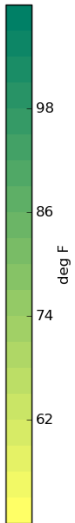






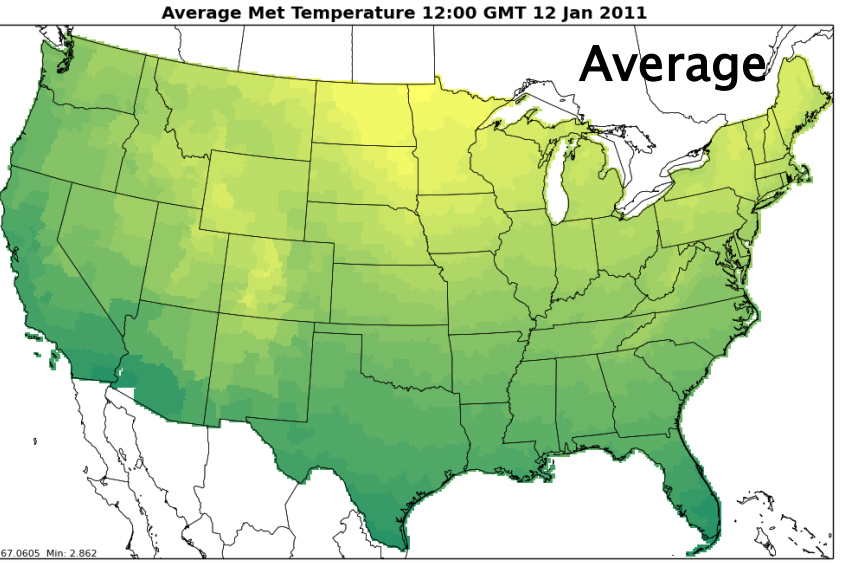


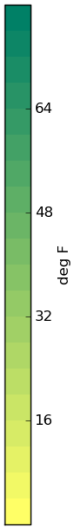


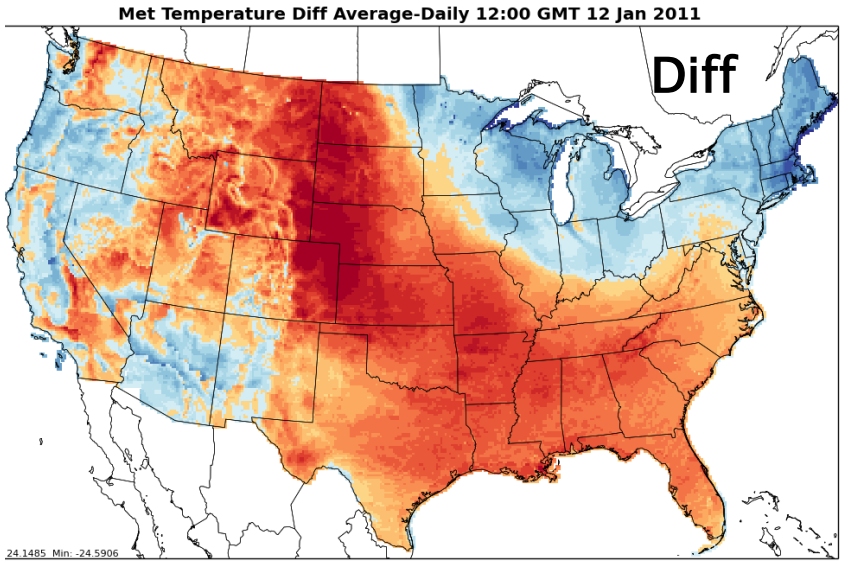


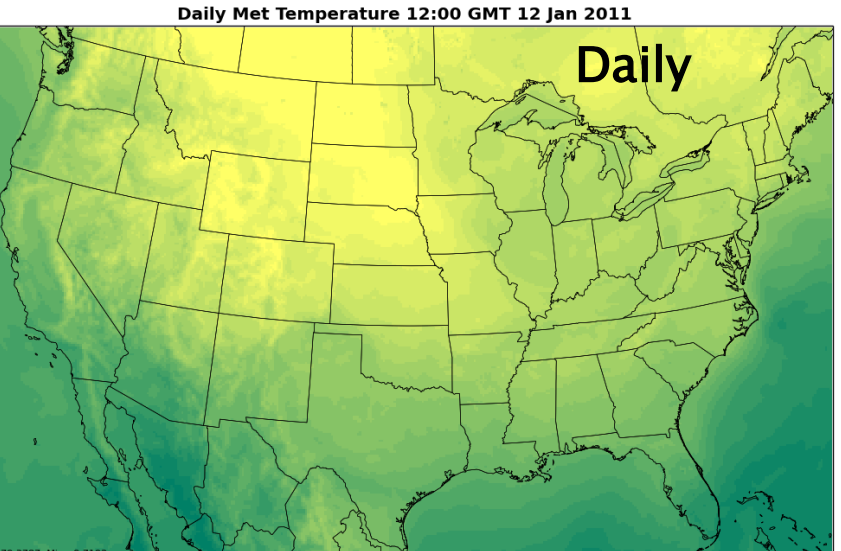
Meteorology (3of 4)

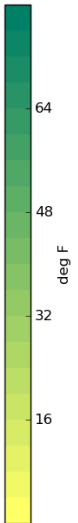
January



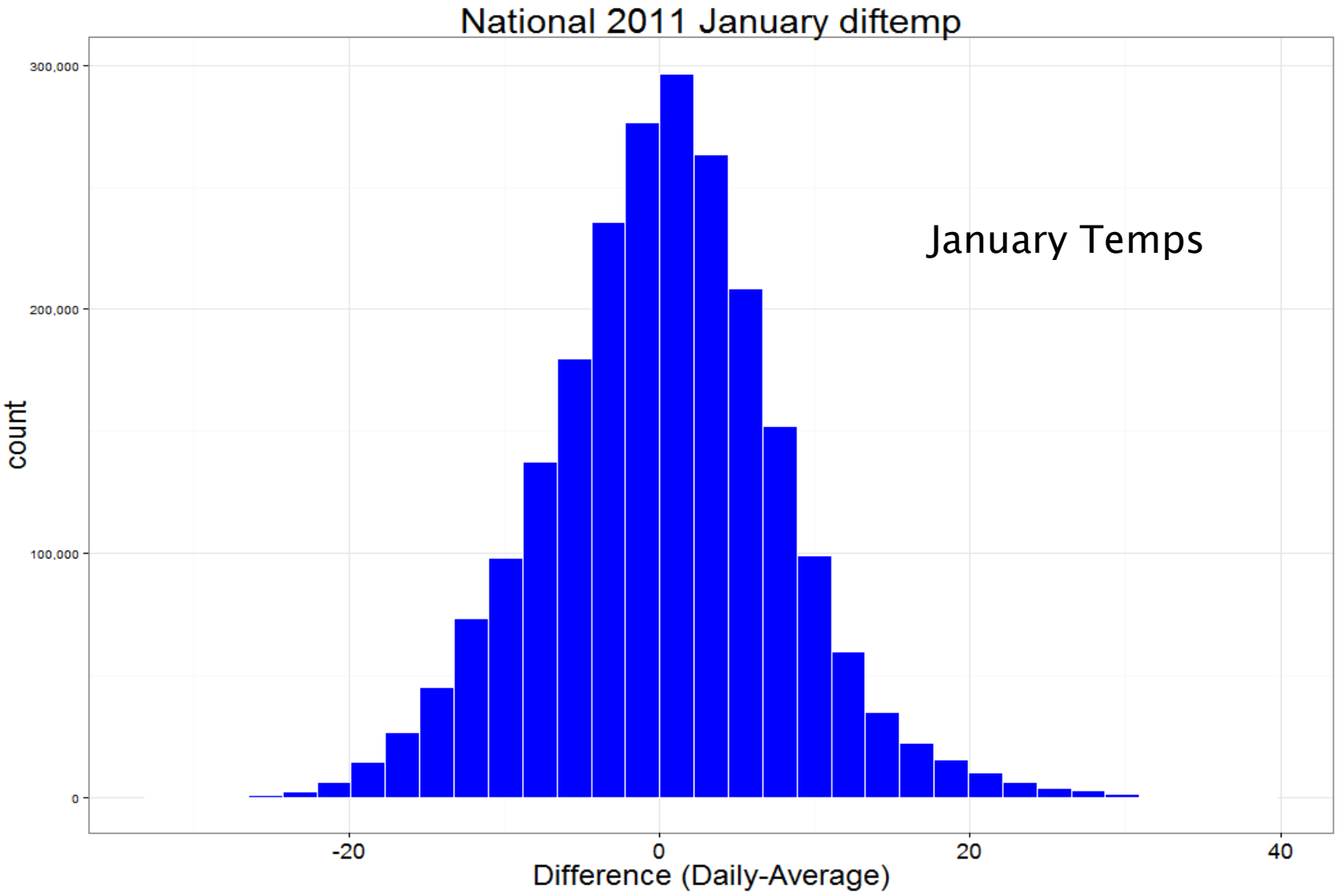






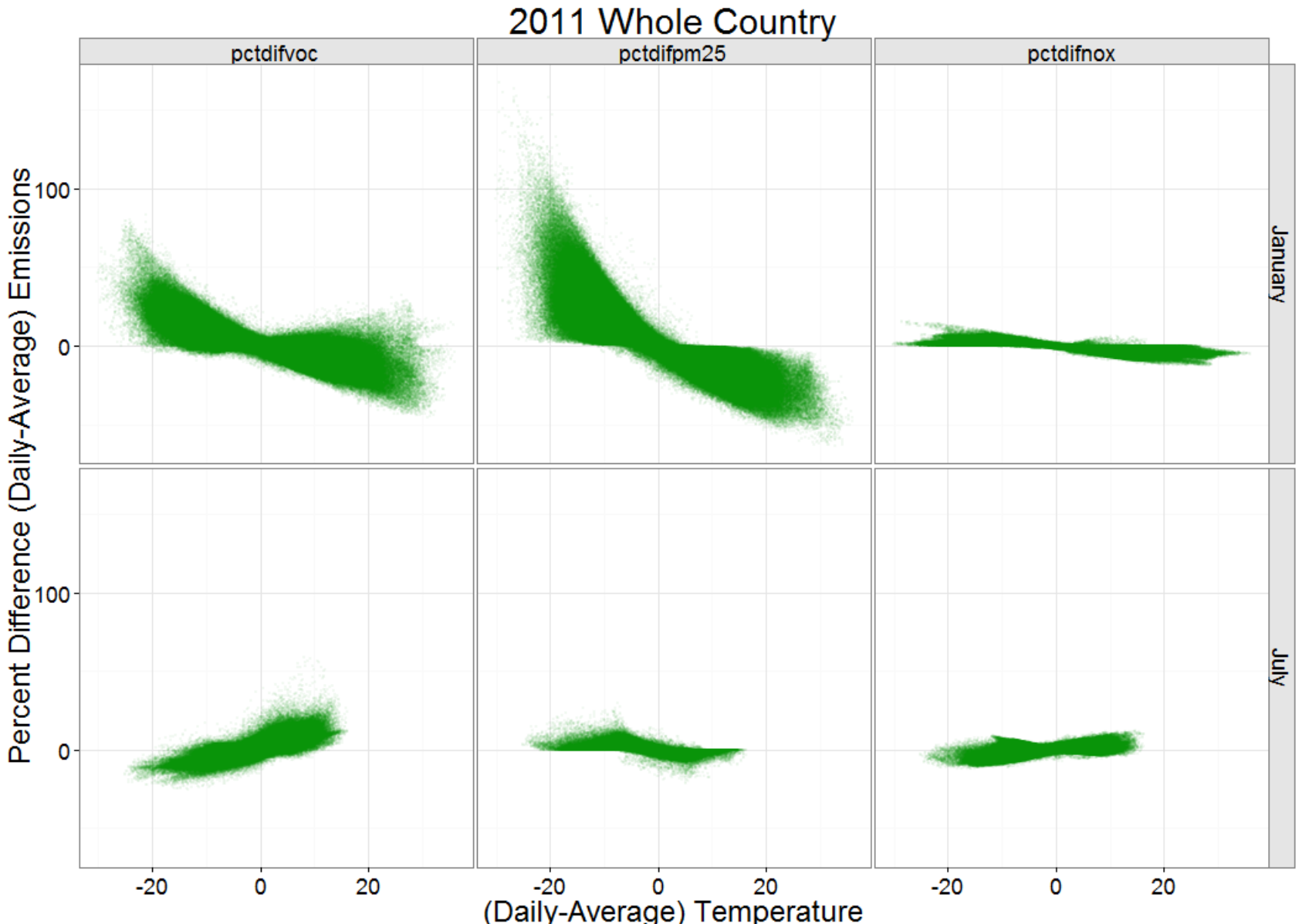


Meteorology (4 of 4)



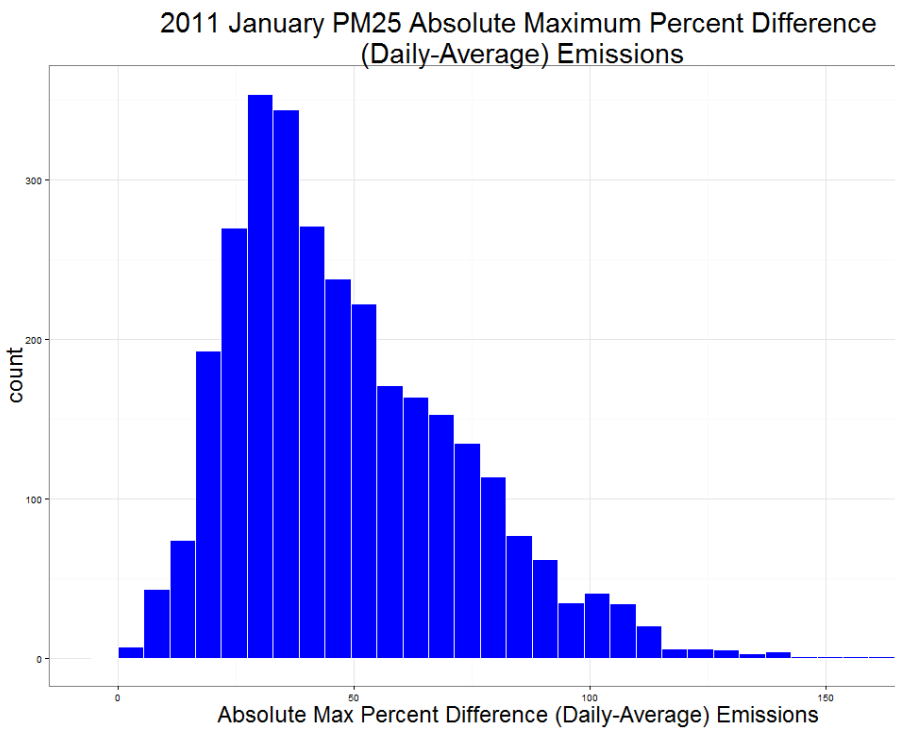
National analysis

Actually lower 47

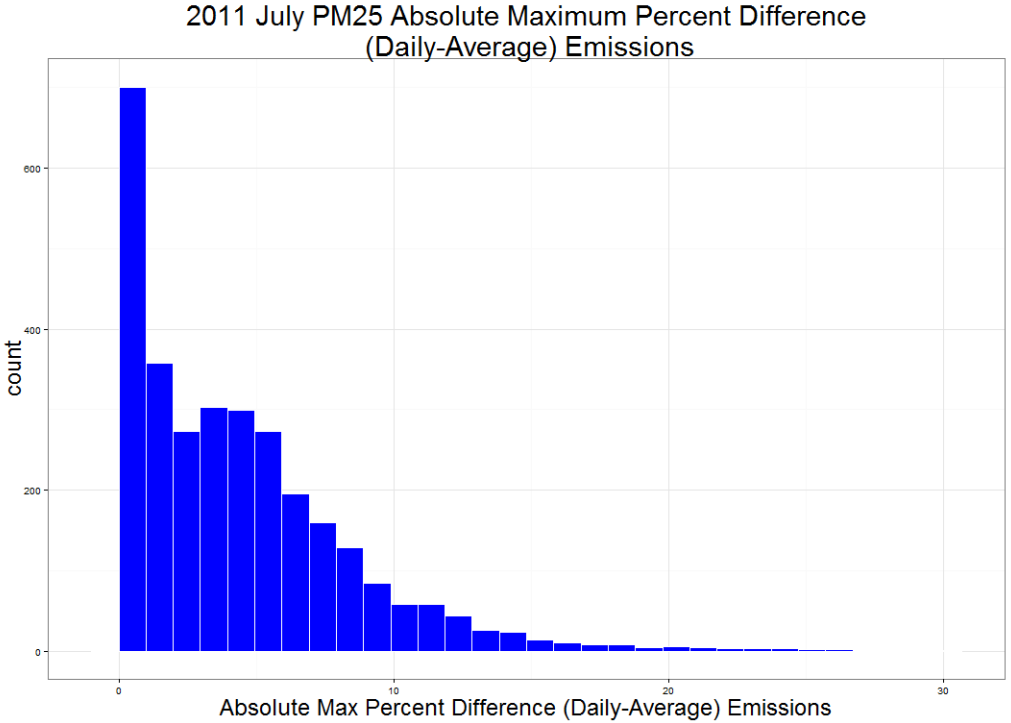


National analysis PM2.5

January

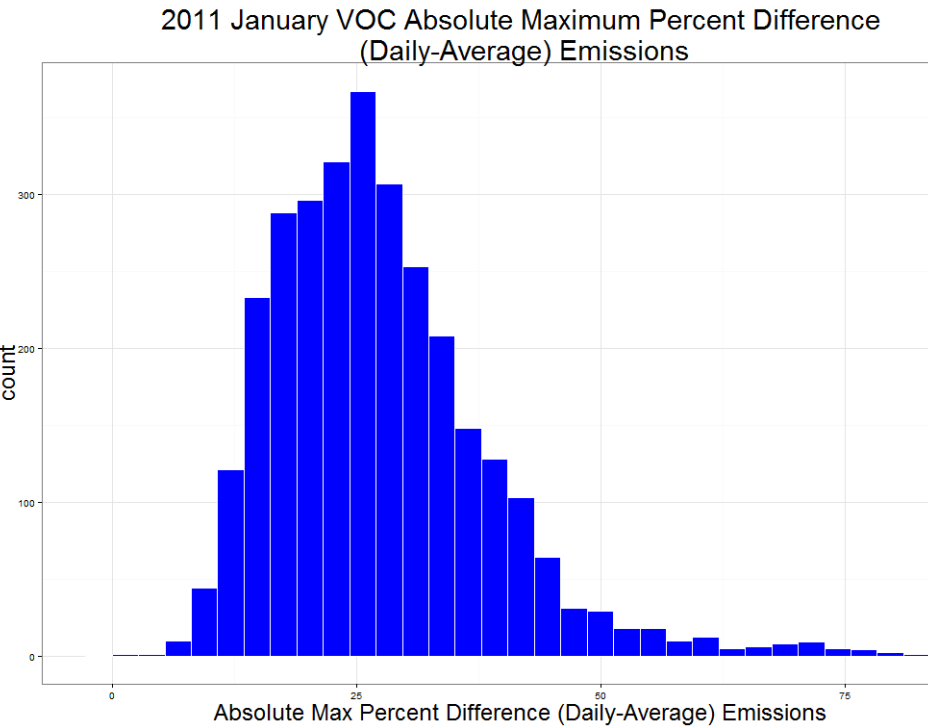


July



National analysis VOC

January



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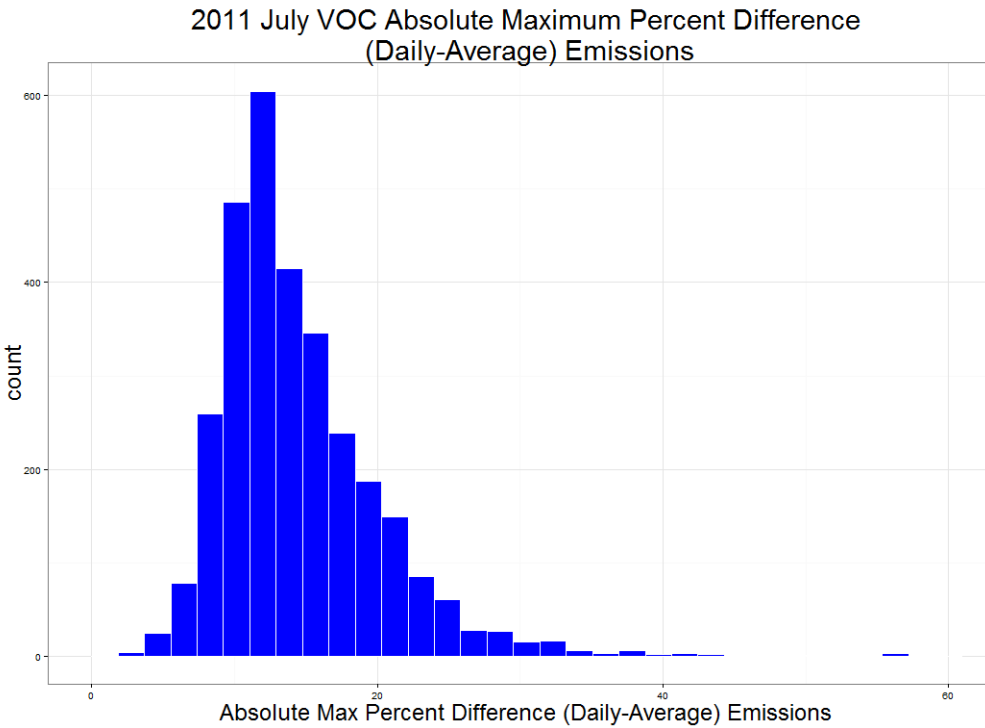
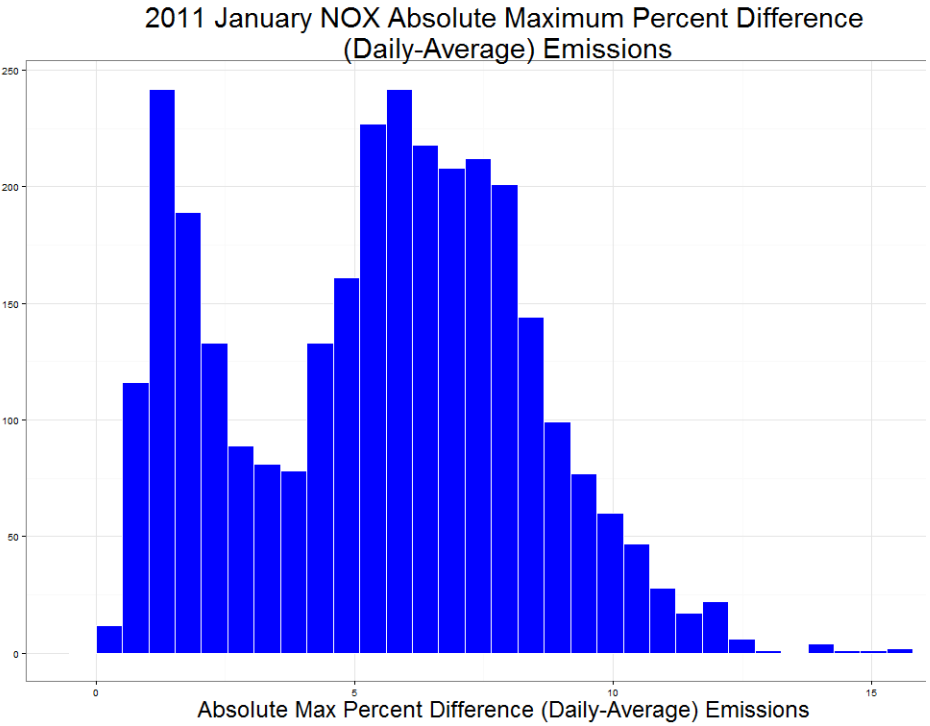


National analysis NOx

January



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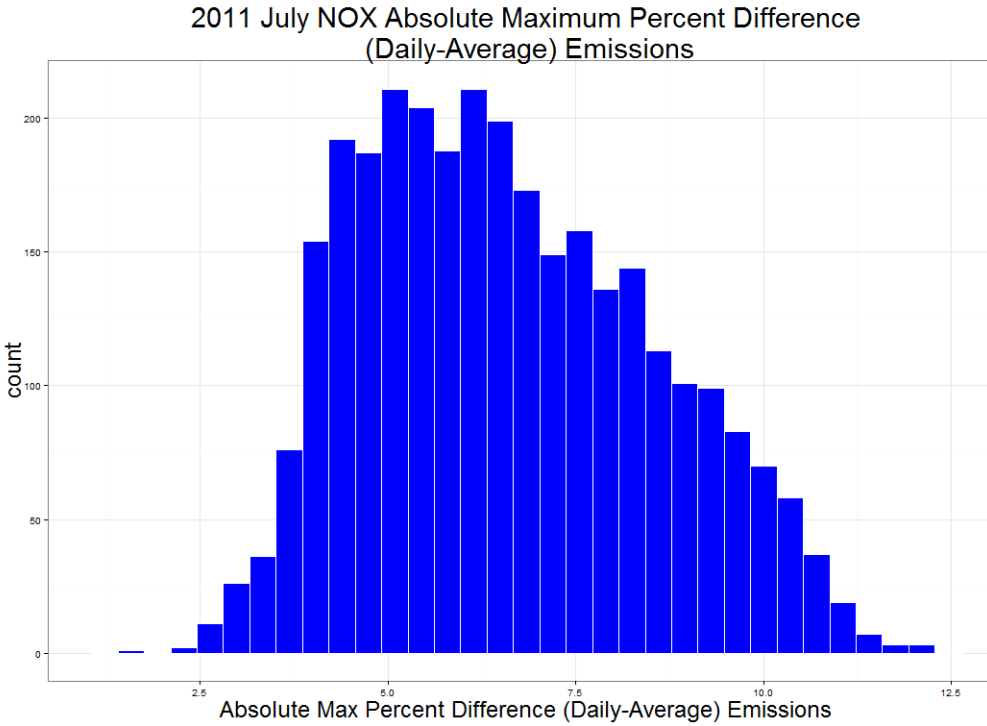
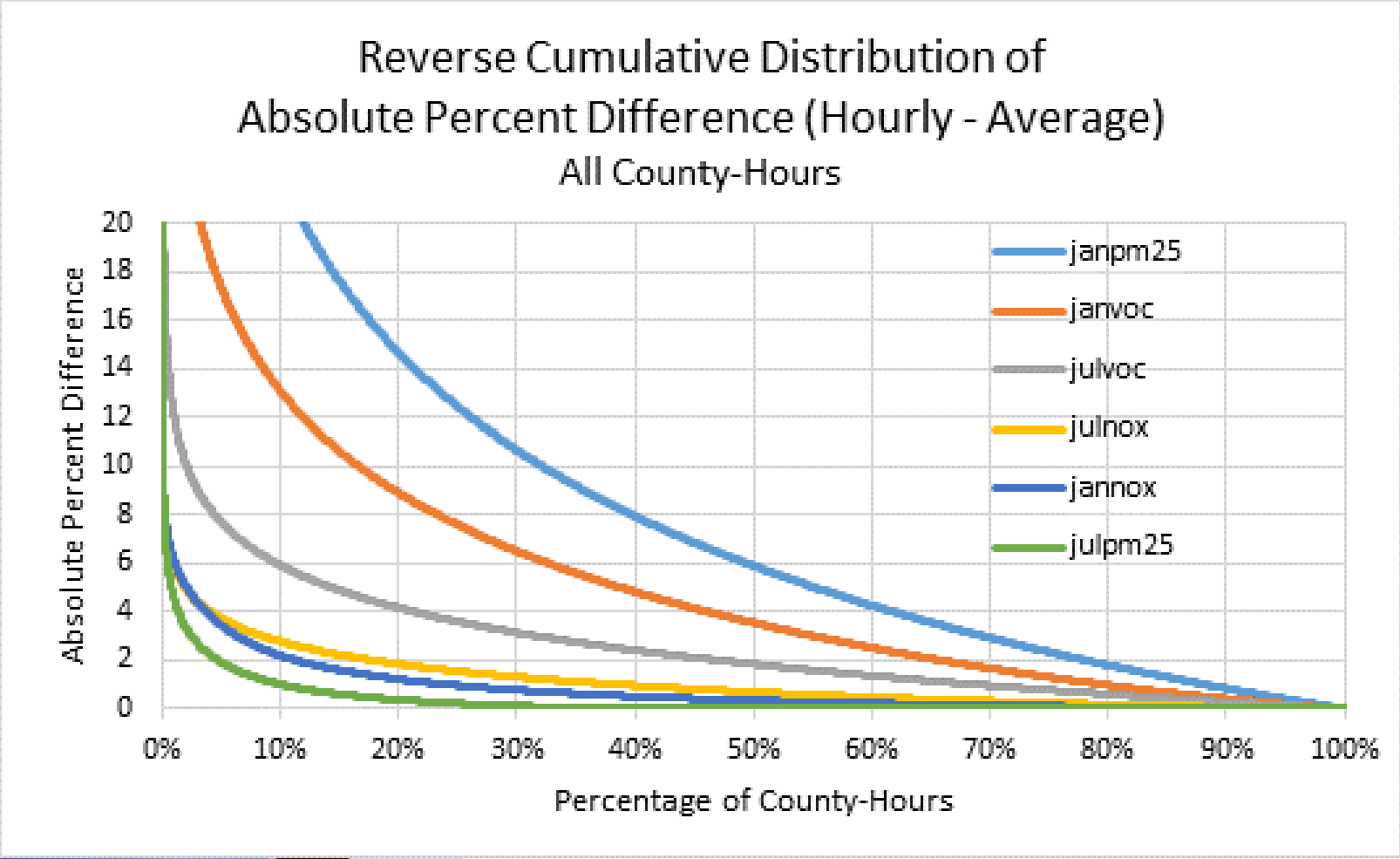
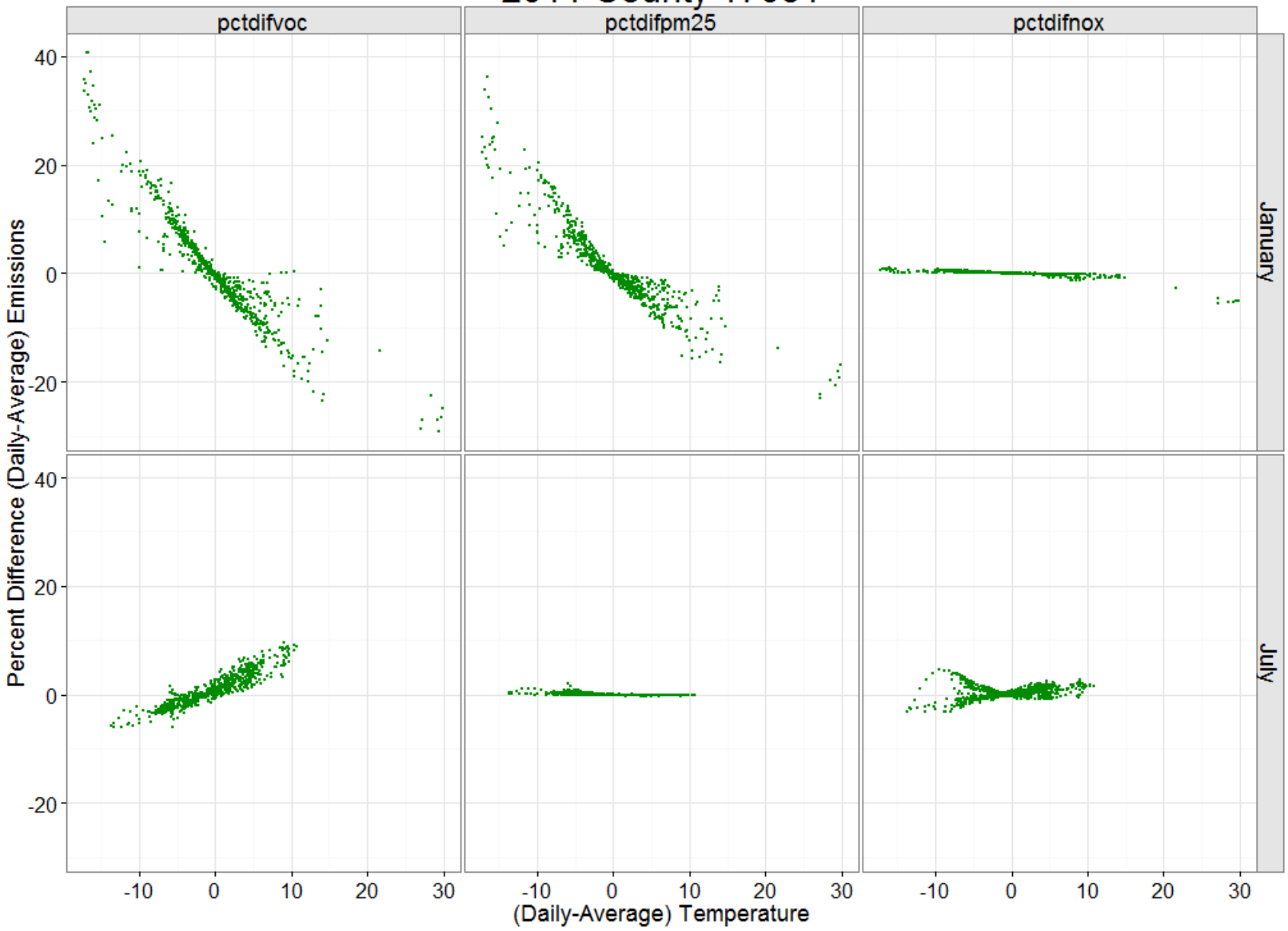


Reverse Cumulative Distribution



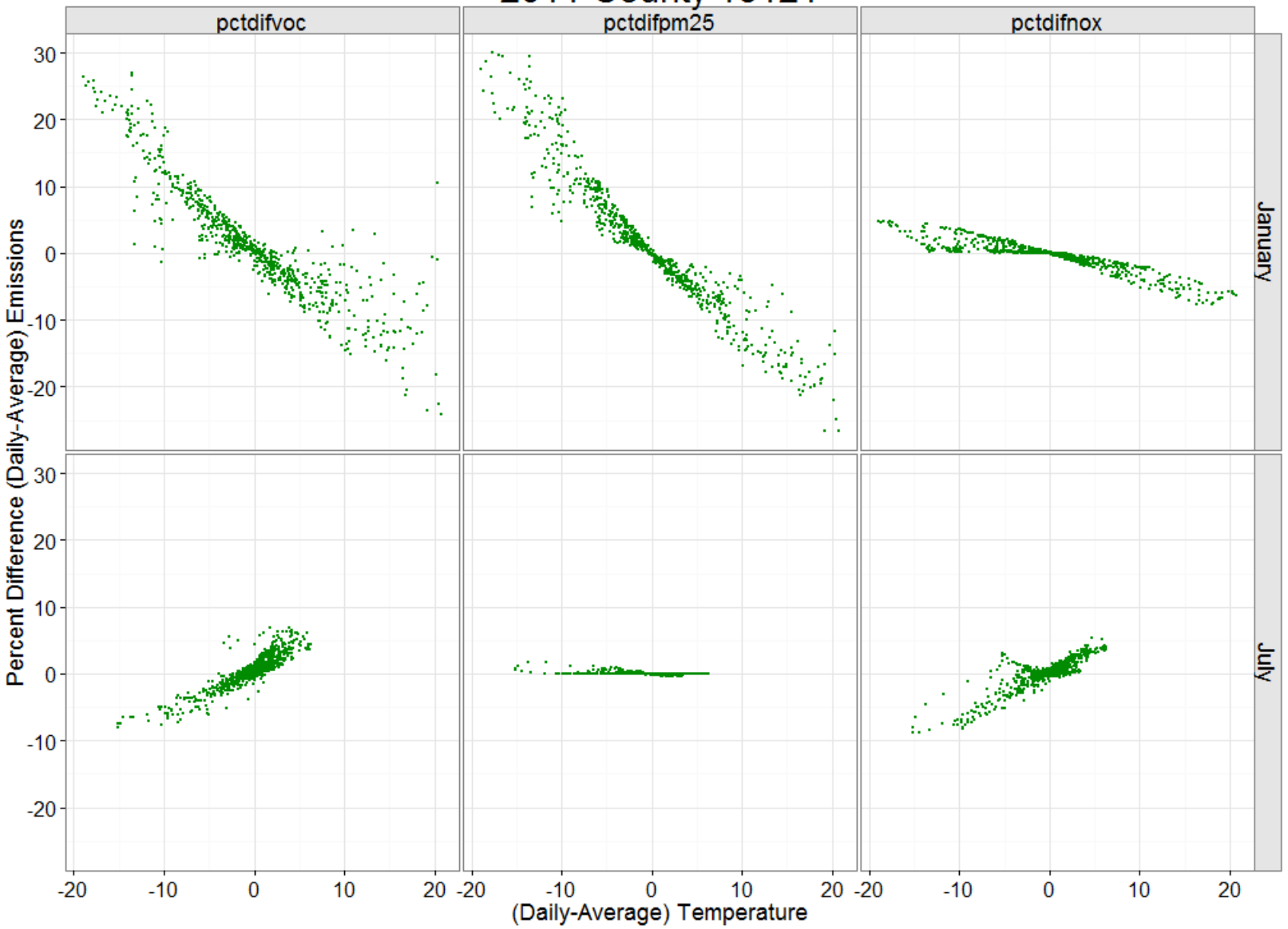
County analysis

Cook, IL



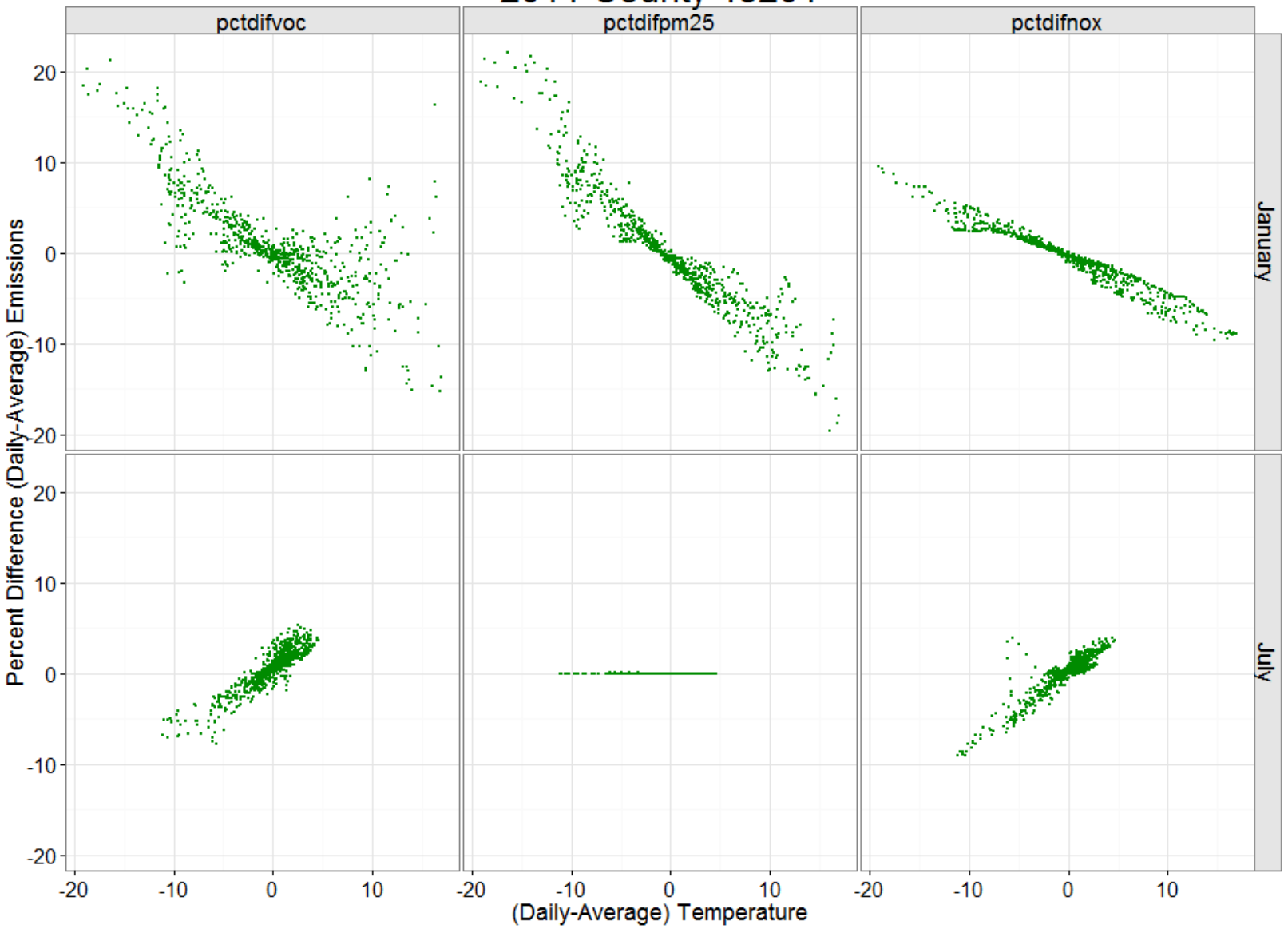
County analysis

Fulton, GA



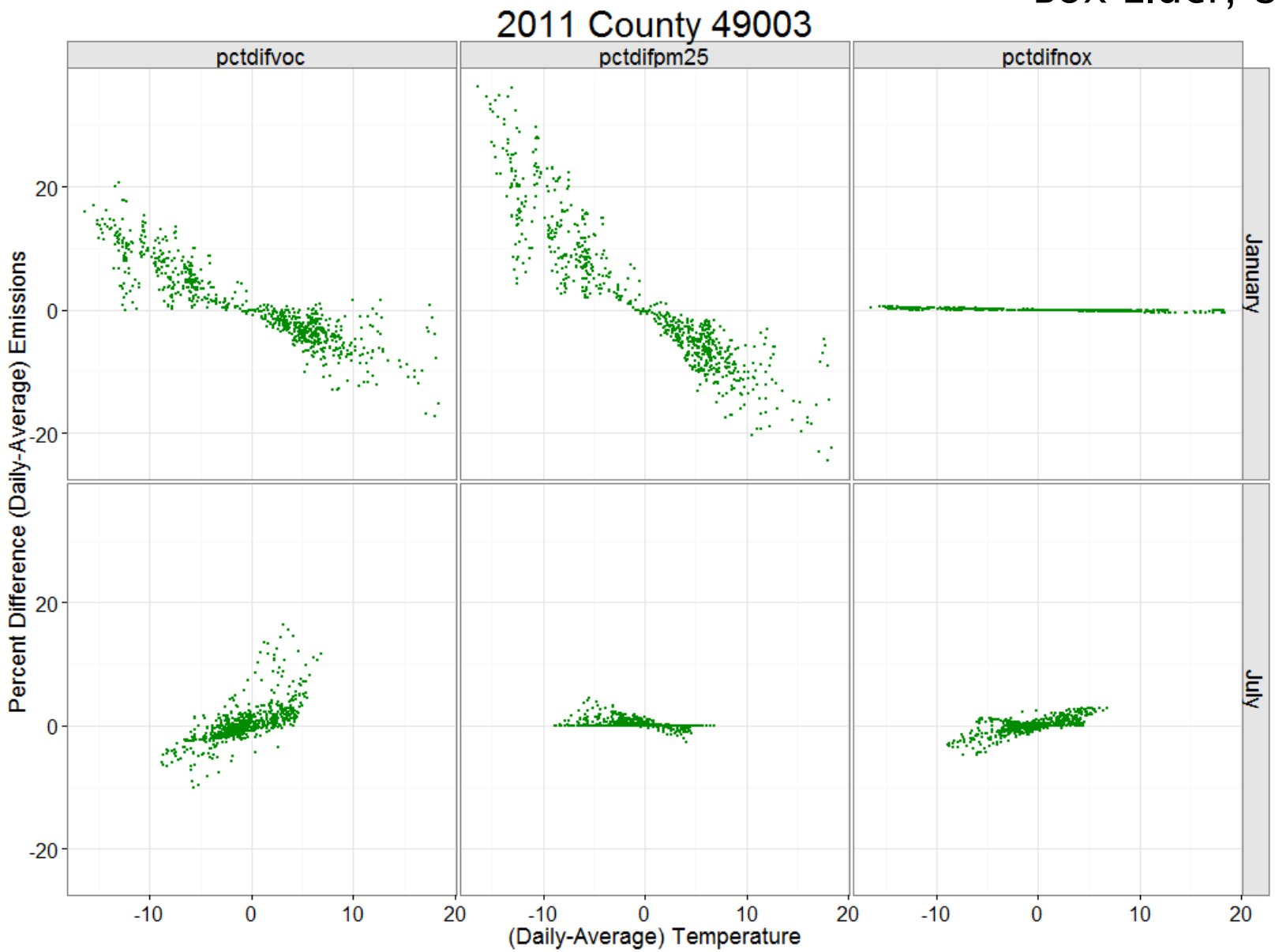
County analysis

Harris, TX



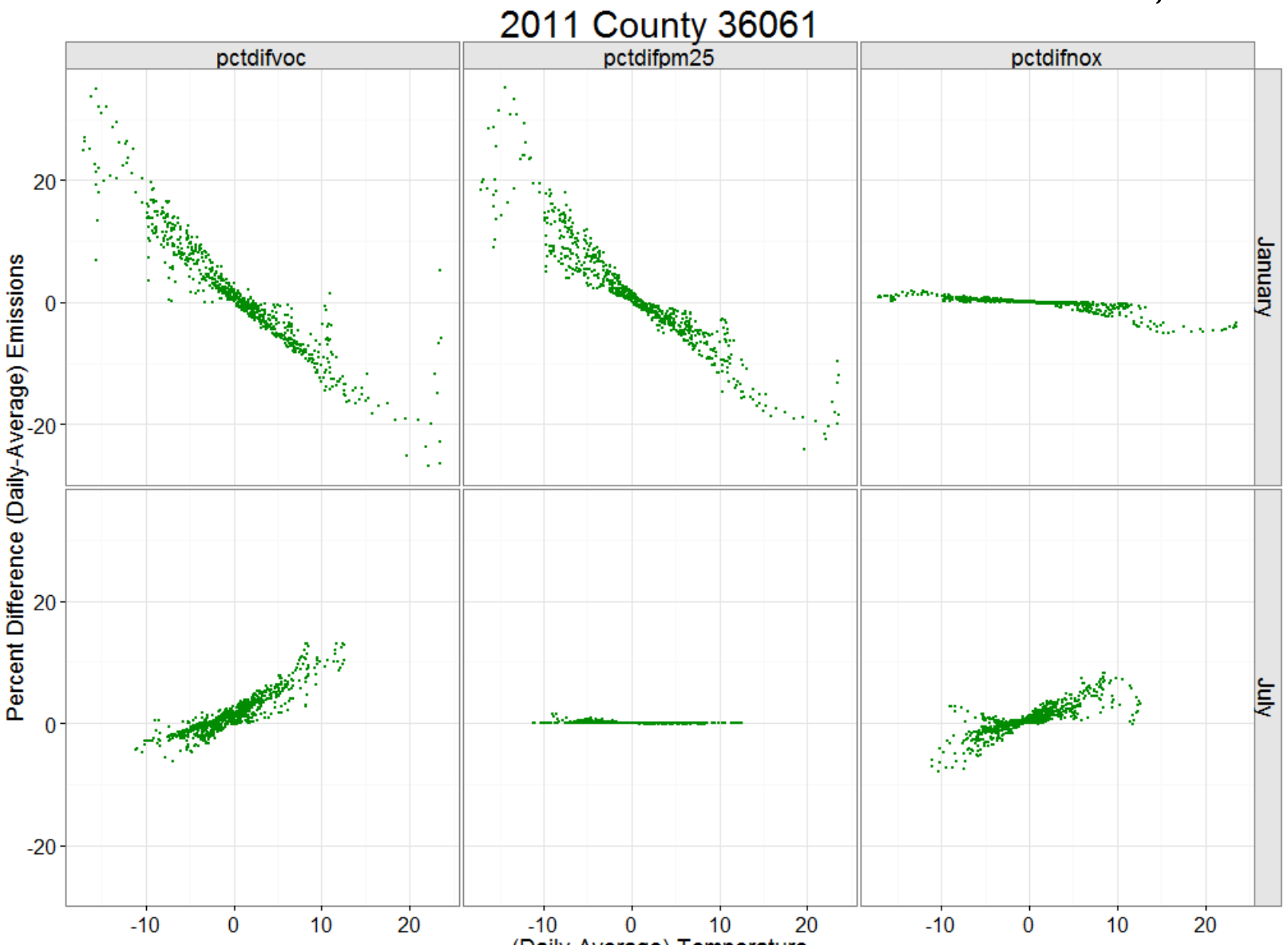
County analysis

Box Elder, UT



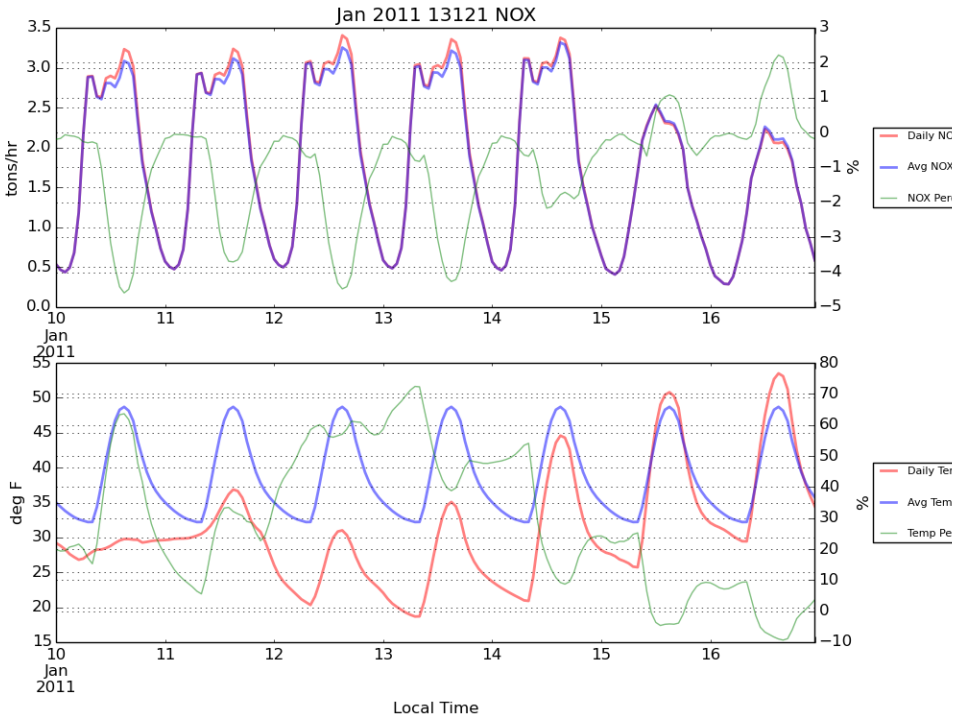
County analysis

NY, NY



County analysis NOx

January



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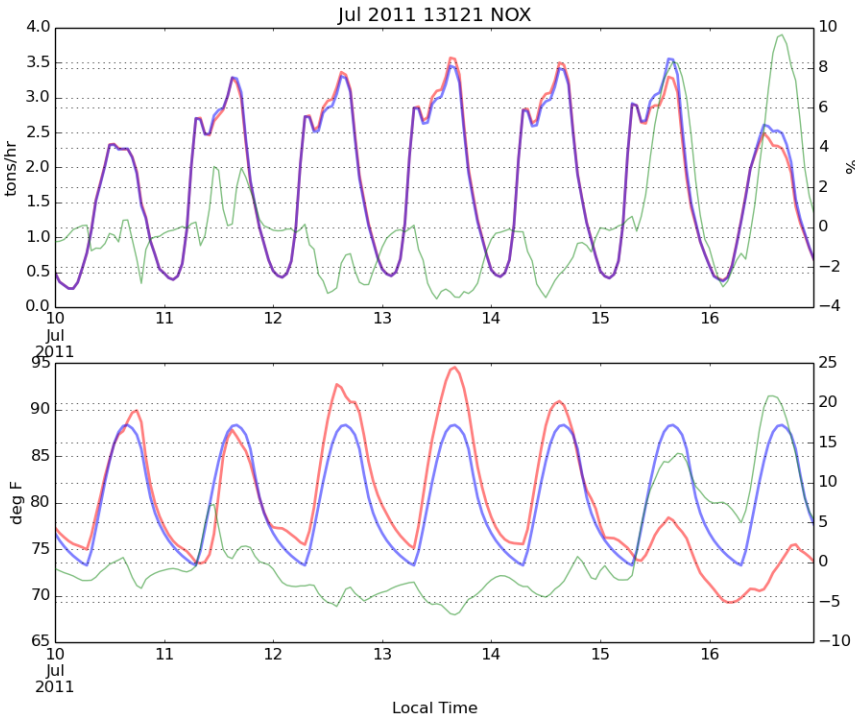
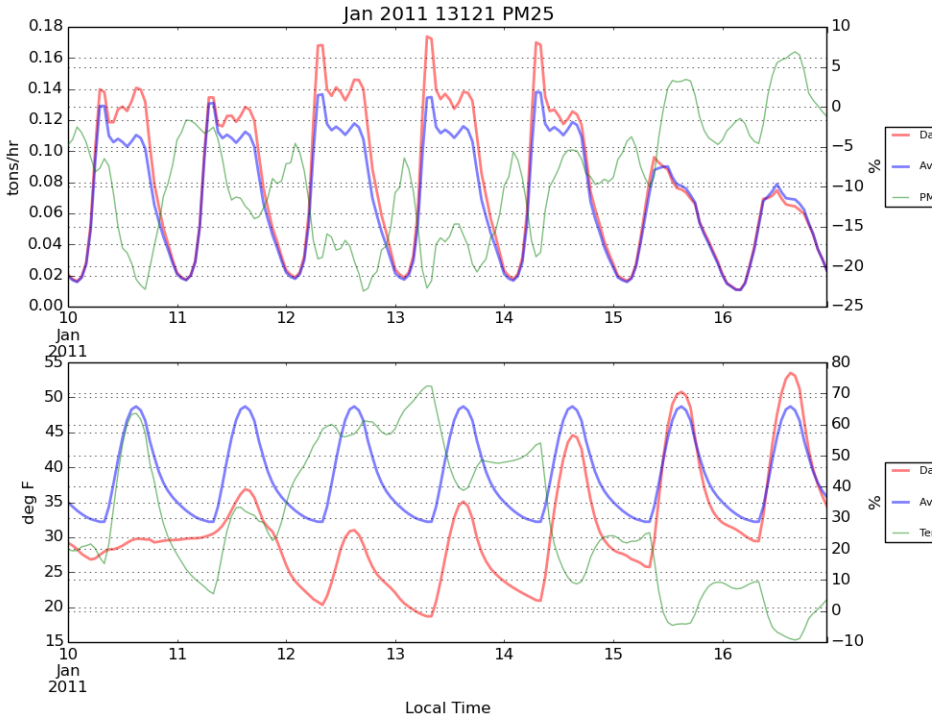


Daily
Average
Percent Diff

Fulton, GA

County analysis PM2.5

January



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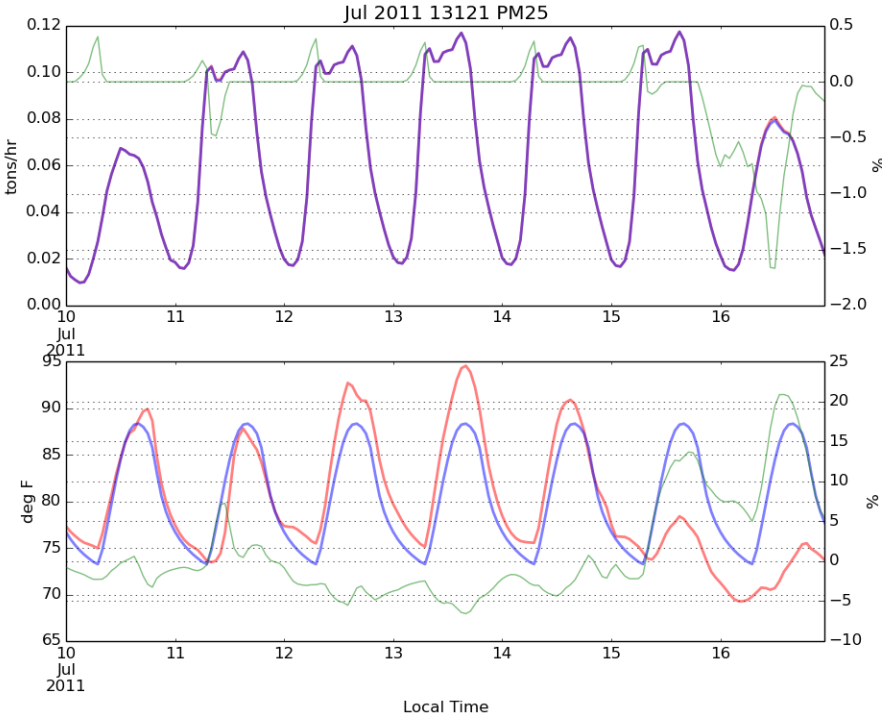
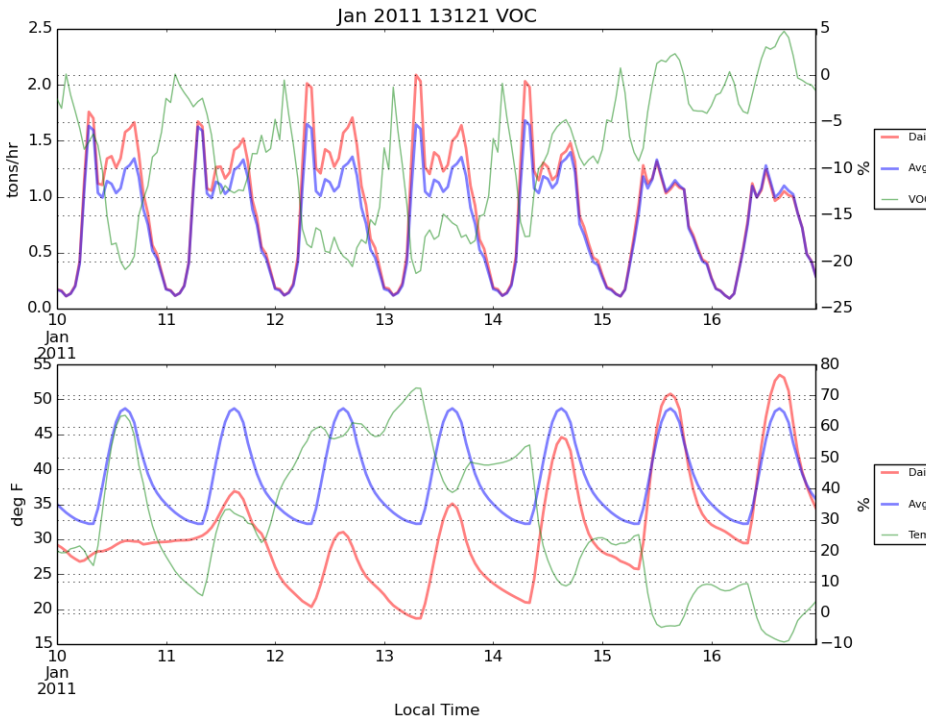


Daily
Average
Percent Diff

Fulton, GA

County analysis VOC

January



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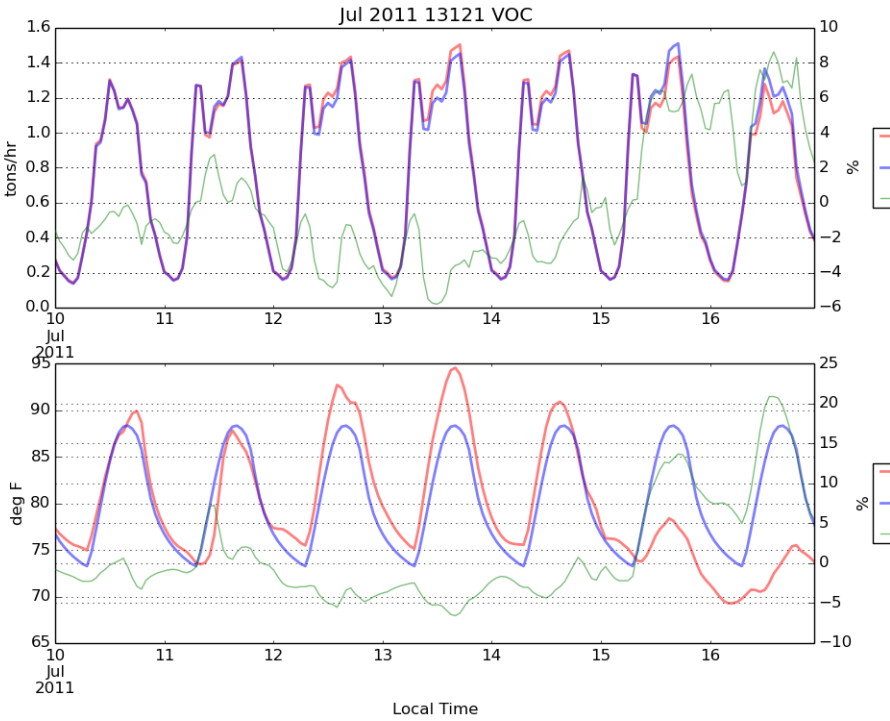
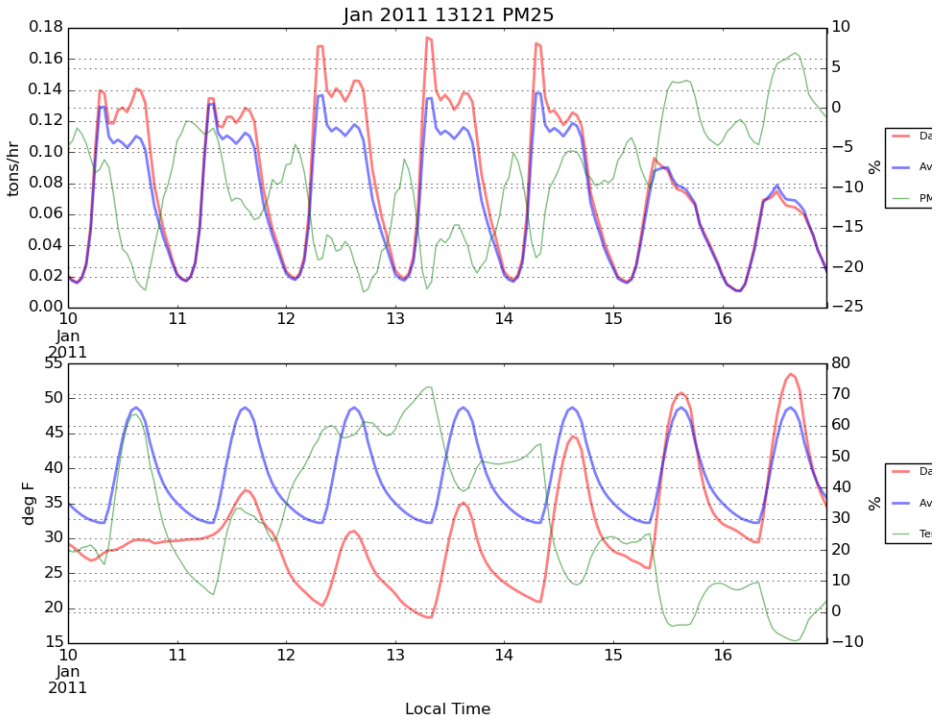


Daily
Average
Percent Diff

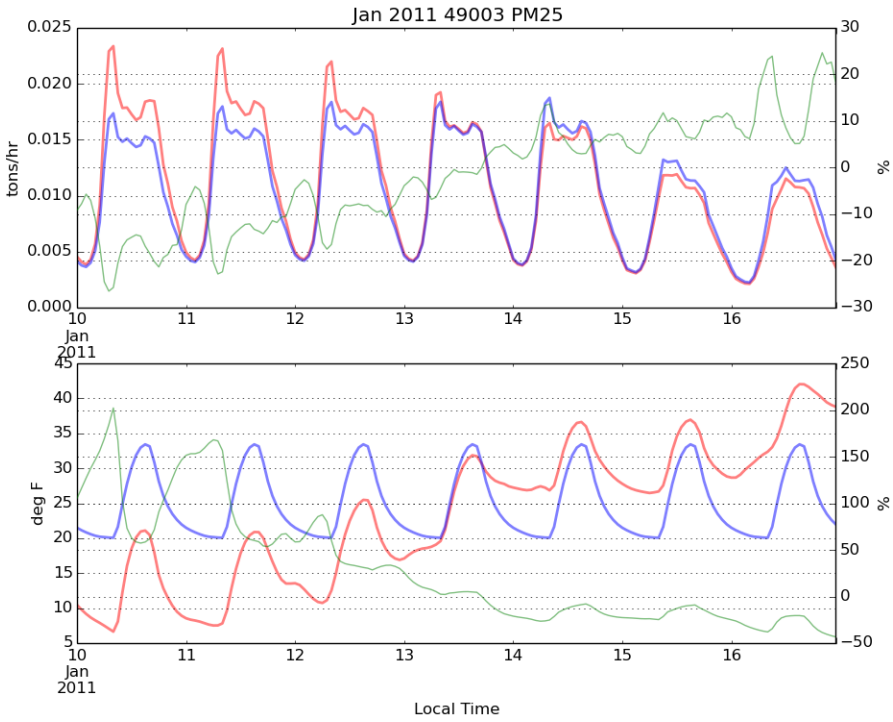
Fulton, GA

County analysis Comparison PM2.5

Fulton, GA: January



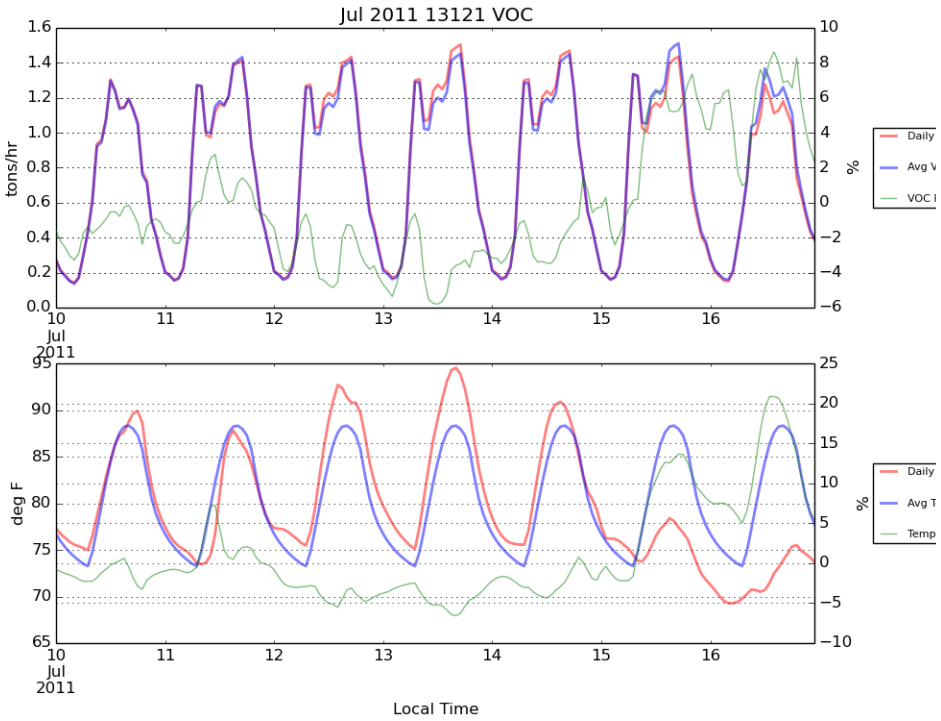
Box Elder, UT: January



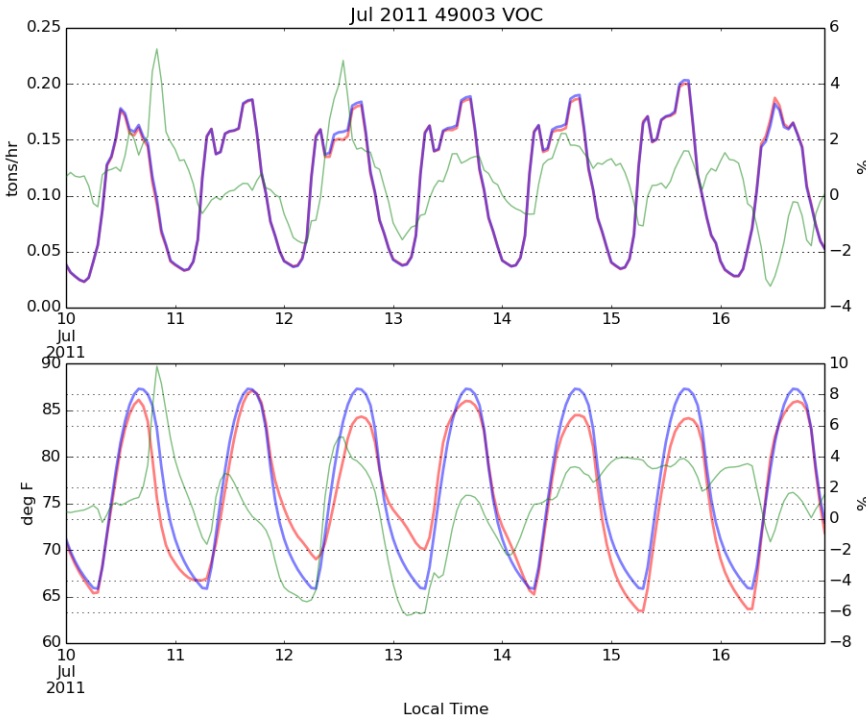
Daily
Average
Percent Diff

County analysis Comparison VOC

Fulton, GA: July



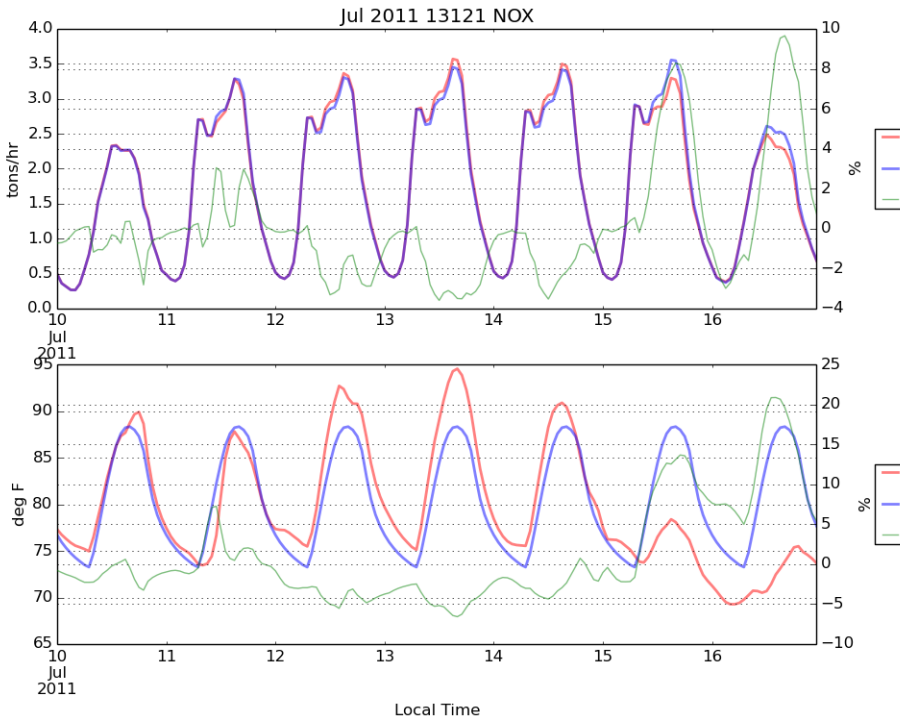
Box Elder, UT: July



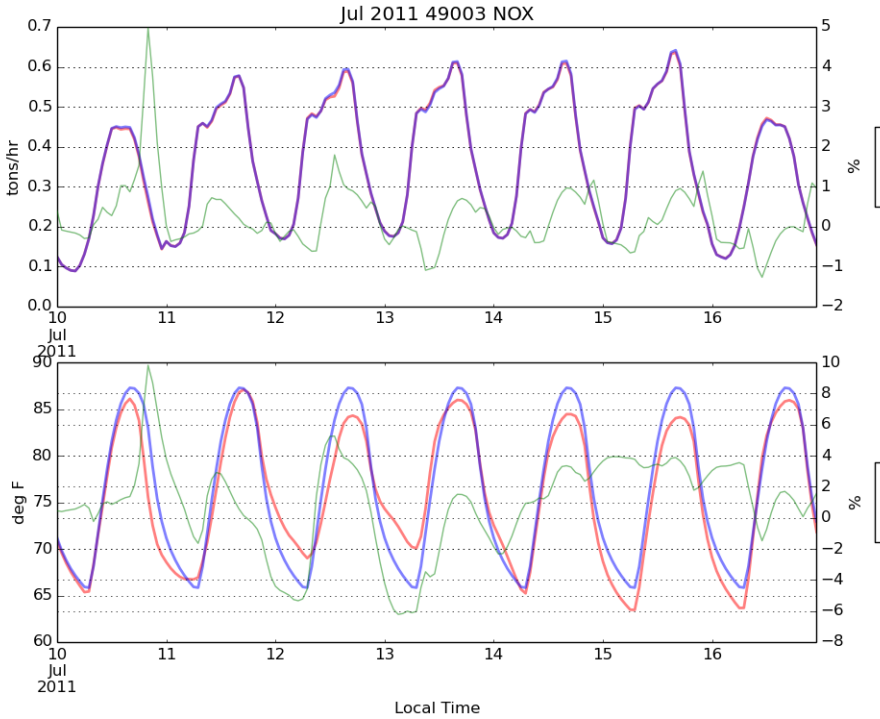
Daily
Average
Percent Diff

County analysis Comparison NOx

Fulton, GA: July



Box Elder, UT: July



Daily
Average
Percent Diff

Summary

- Competing influences
  - Cold starts vs AC and hot soak (VOC)
  - Depending on where in temperature range, one will dominate
- Preliminary results:
  - Winter time:
    - Stronger sensitivity to temperature
    - PM2.5 and VOC especially sensitive
  - Summer time:
    - PM2.5 little sensitivity unless getting to colder temperatures
    - NOx and VOC have sensitivity, VOC having greater variation
  - Temporal
    - Impact is concentrated on particular hours of particular days

Next Steps

- Investigate sub-county variation
  - Gridded results may show significant variation within the county
- AQ model
  - Impact on specific O3 episodes
  - Impact on particular PM areas