A Detailed Approach for Improving Continuous Emission Monitoring Data for Regulatory Air Quality Modeling

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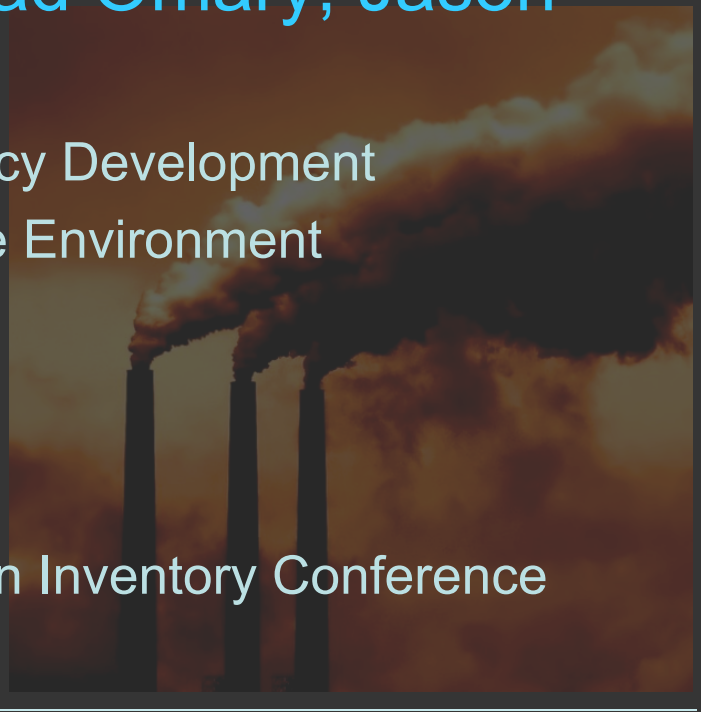

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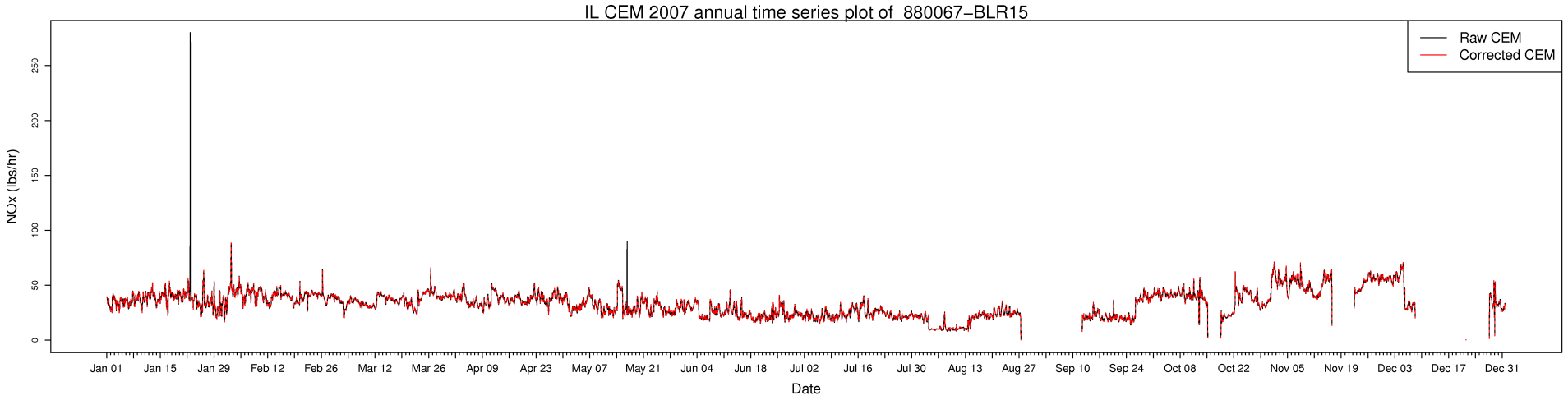
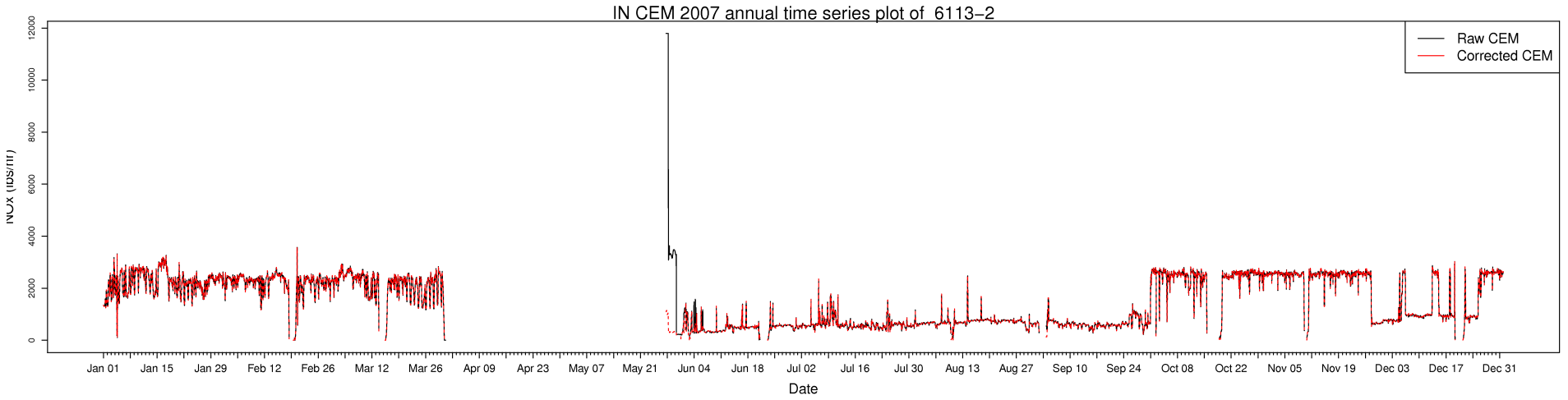
Year 2007 CEM NOx Emissions





Objectives

- Identify and correct anomalies in the CEM inventories
- Reconcile differences between CEM and NEI point inventories
- Identify full and partial-year reporting CEM sources
- Calculate emissions for the non-reporting period for partial-year reporters

CEM Anomalies

- Continuous Emission Monitor (CEM) data available for hourly NOx, SO2, heat input, gross load, and steam load
- CEM sources required to report for every operating hour
- Gapfilling of missing readings can produce values much larger than the actual emissions
- Metadata in the CEM database can be used to identify anomalies

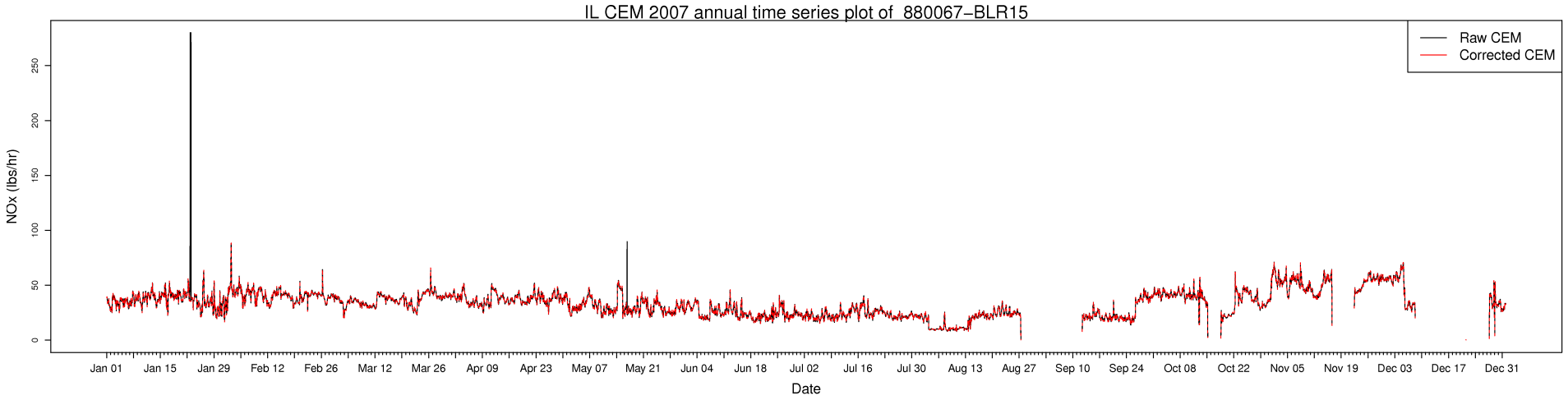
CEM Anomalies

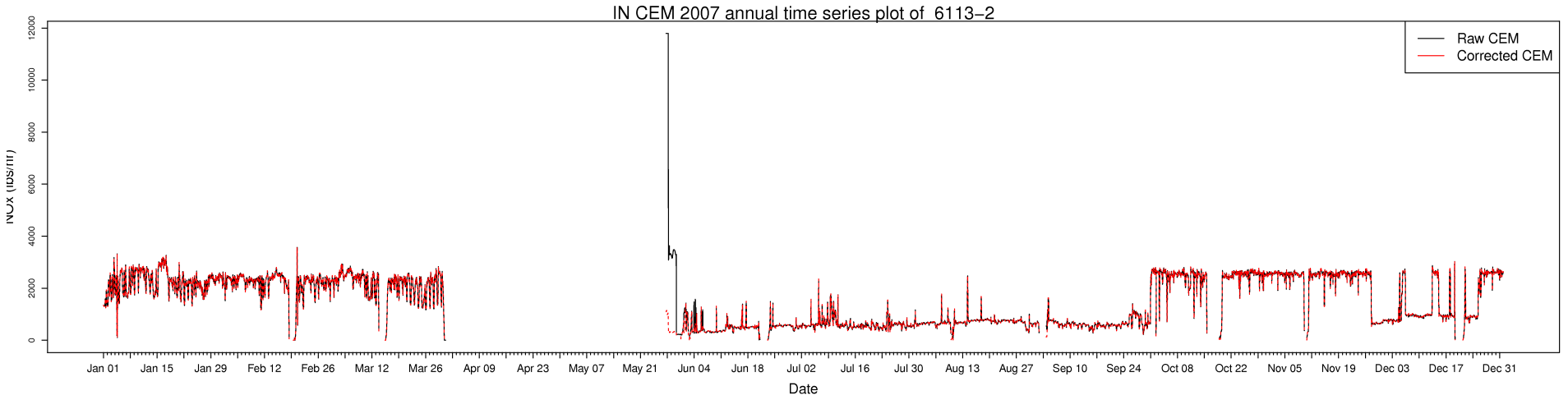
- Hourly CEM NOx, SO2, and heat input flags:
  1. Measured
  2. Calculated
  3. Substituted
  4. Measured and substituted
- First compute annual or seasonal means by source/hour for records flagged 1 and 2
- Anomalies identified on an hourly basis:
  - records flagged as 2, 3, or 4 AND
  - hourly value > 2x annual or seasonal mean for that source/hour

CEM Anomalies

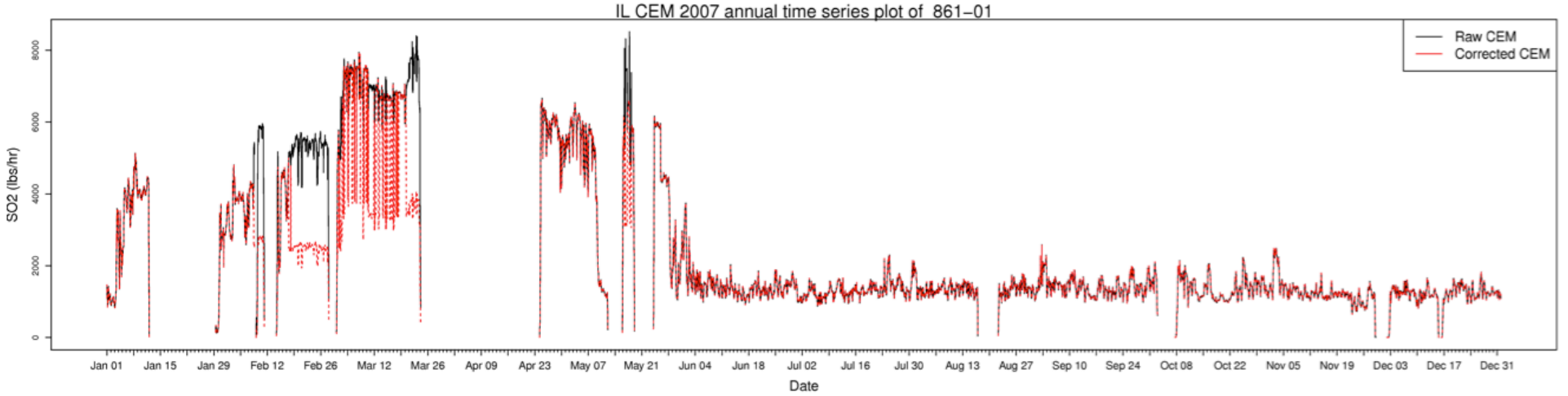
- Anomaly scrubbing process
  1. Scrub anomalies in the hourly heat input data
  2. Calculate mean emissions rates (lbs/mmBTU)
     - SO2 = annual mean rate
     - NOx = ozone season rate (May-Sep)
     - NOx = non-ozone season rate (Jan-Apr, Oct-Dec)
     - Atypical operations (e.g. new SCR installation)
  3. Calculate NOx and SO2 hourly replacement values as product of scrubbed HI and mean emissions rates
  4. Identify and replace NOx and SO2 anomalies
- Output scrubbed CEM data and flag replaced values

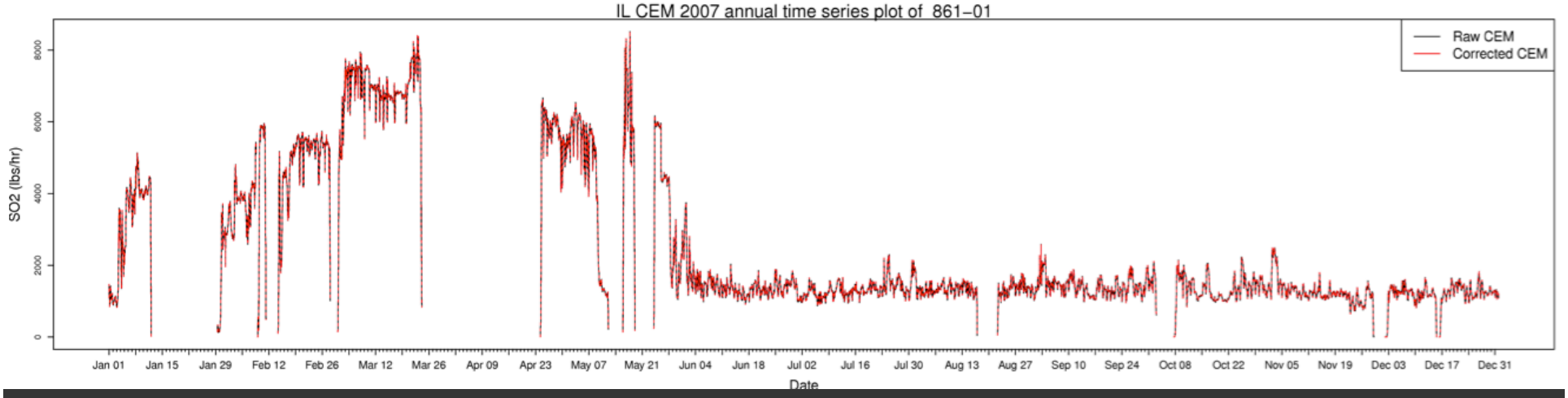
Year 2007 CEM NOx Emissions



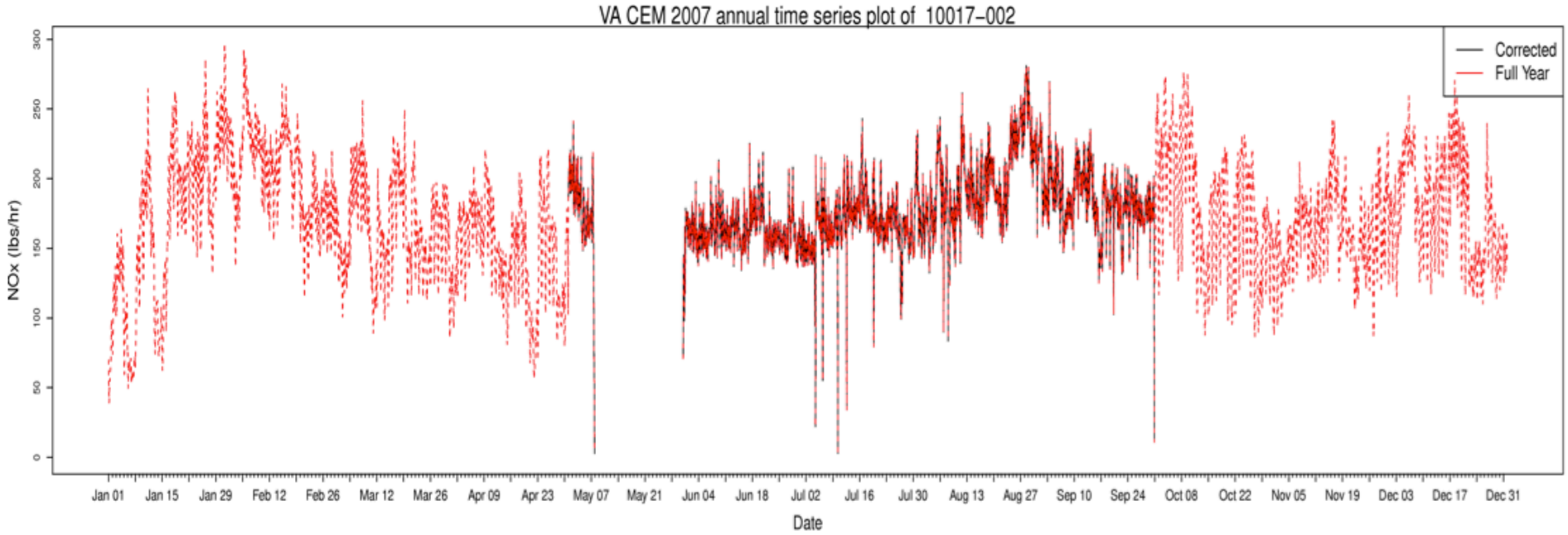


Atypical Operations





Partial Year Reporters



- CEM sources that report only for part of their operating year
- Annual total CEM < annual inventory
- CEM data are missing or null for at least one full month

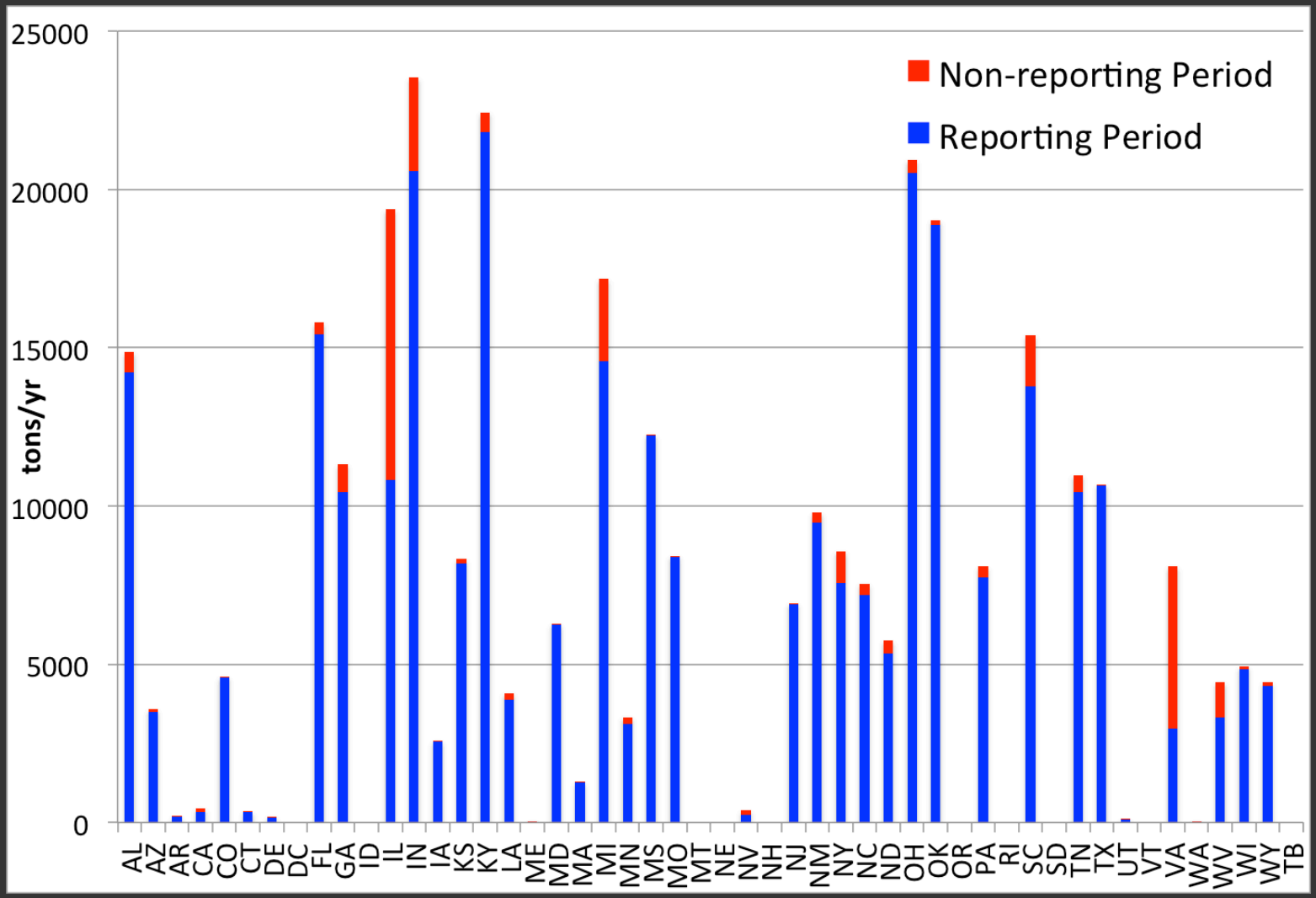
Partial Year Reporters

- Identify partial year reporters
- Calculate reporting and non-reporting period emissions
- Develop hourly temporal profiles for the non-reporting period
  - NOx, SO2, and heat input
  - Representative CEM sources: Same state + same SCC
  - Fall back to SCC hierarchy
- Approach requires consistency in years between annual and CEM inventories

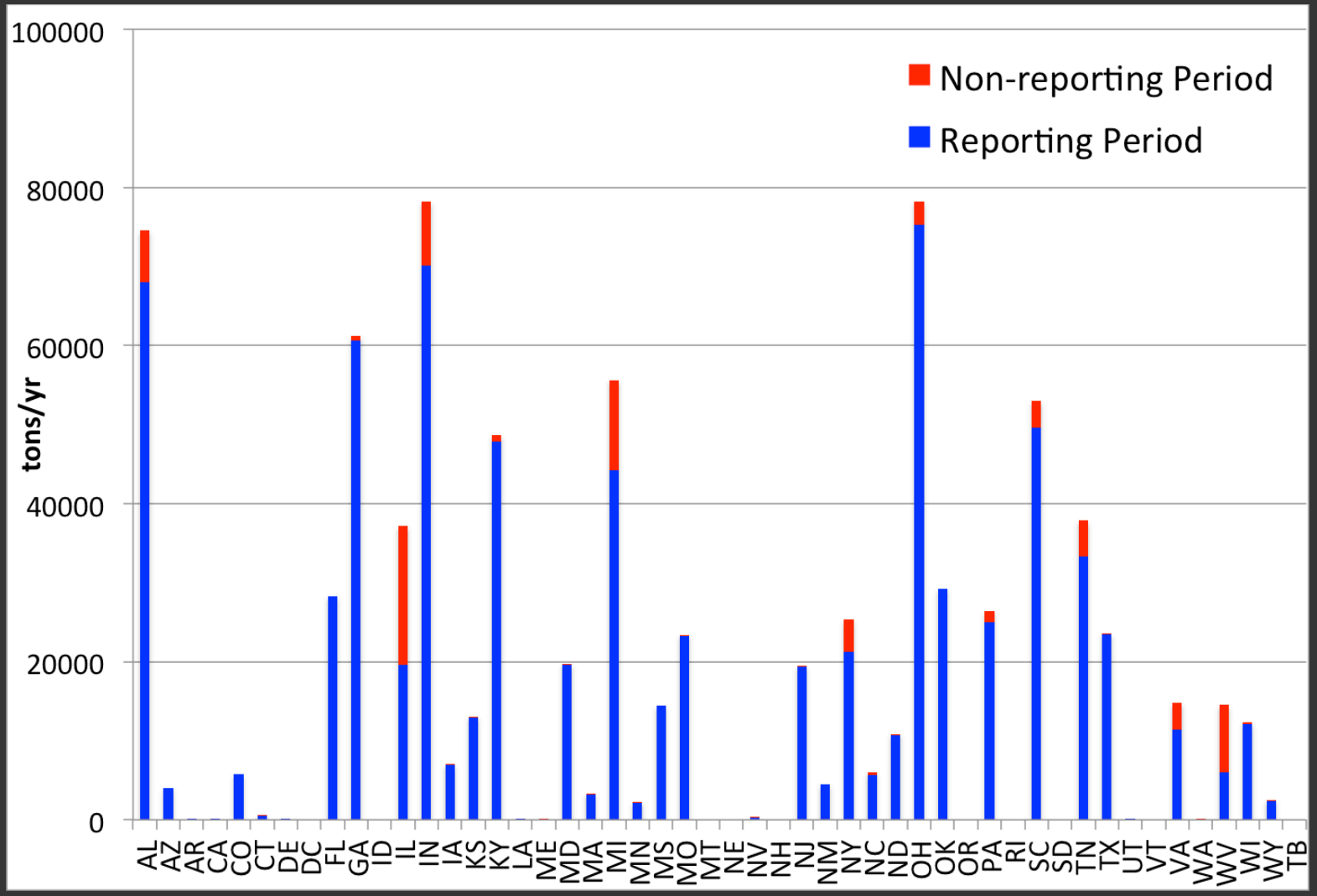
Results

- 2007 CEM anomaly scrubbing
  - NOx: 9,764 tons and 46,388 hours
  - SO2: 10,511 tons and 8,903 hours
  - Heat input: 14,142 x 10^3 mmBTU and 14,744 hours
- 2008 CEM anomaly scrubbing
  - NOx: 11,258 tons and 59,110 hours
  - SO2: 13,525 tons and 13,152 hours
  - Heat input: 13,915 x 10^3 mmBTU and 20,965 hours

Results: 2008 Partial Reporting NOx



Results: 2008 Partial Reporting SO2



Conclusions and Future Work

- Approaches applied to 2007 and 2008 modeling for SESARM, MARAMA, WestJump, and OAQPS modeling studies
- Targeted air quality sensitivities
- Refinements to estimating the replacement values for anomalies
  - Use monthly averages rather than annual/seasonal averages
- Java program *CEMCorrect* for scrubbing anomalies available upon request