

# Ozone standards and health effects

- National Ambient Air Quality Standards (NAAQS) currently in effect
  - **2015:** 0.070 ppm (or 70 ppb)
  - **2008:** 0.075 ppm (or 75 ppb)
  - Both defined as the 3-year average of the daily 4th maximum 8-hour values (truncated)
- Health effects
  - Irritates the airways and reduces lung function, causing coughing, sore or scratchy throat, and shortness of breath
  - Aggravates chronic lung diseases such as asthma, emphysema and bronchitis
  - Increased risk of premature death in people with heart and lung disease
  - Groups at risk include:
    - People with lung disease, especially children with asthma
    - Children and older adults
    - People who are active outside, especially children and people who work outdoors

Analogy:  
1 ppb is 1 drop  
in a large gas  
tanker truck



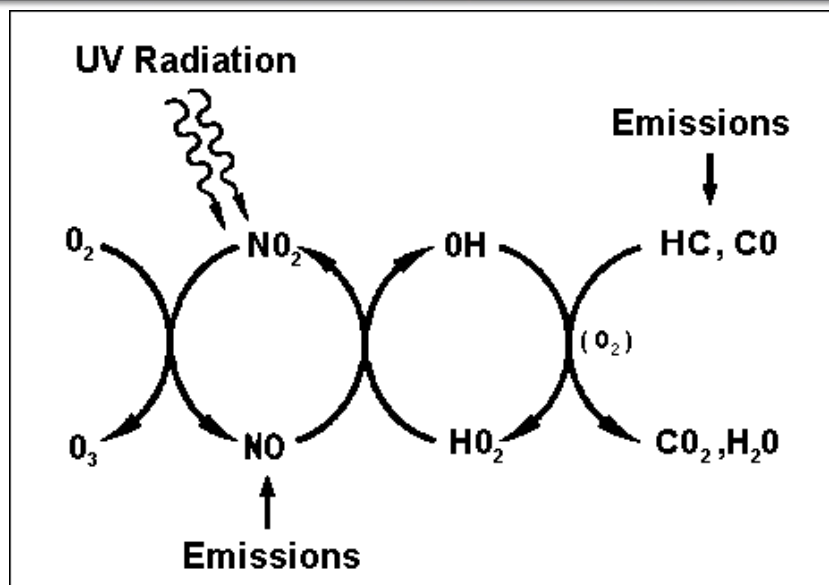
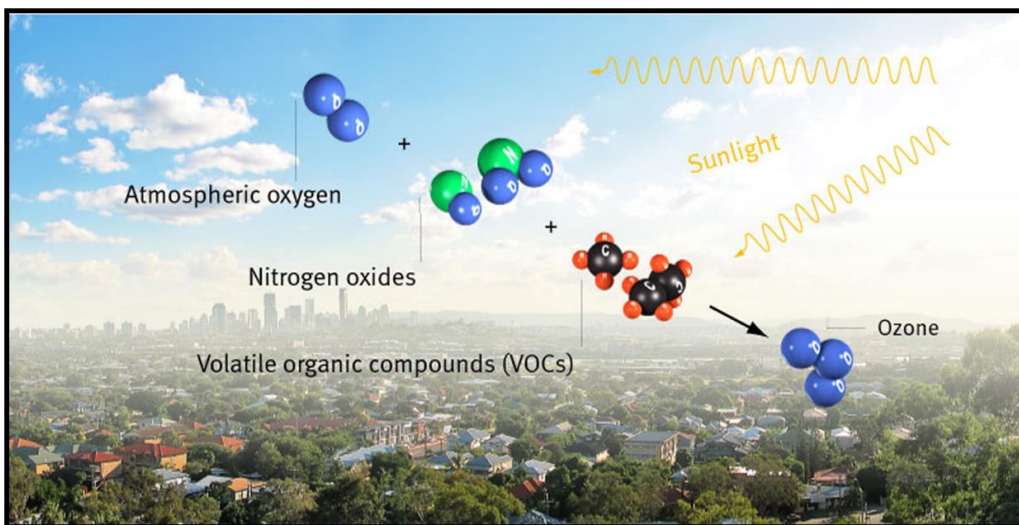
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# Ozone formation

- Typically not directly emitted but secondarily formed
- Formed through complex interaction between volatile organic compounds (VOCs) and nitrogen oxides (NO<sub>x</sub>) in presence of sunlight
- Highest ground-level ozone concentrations usually occur in the summer
- Precursor emissions include:
  - motor vehicles
  - industry
  - oil and gas production
  - Biogenic (i.e. vegetation)



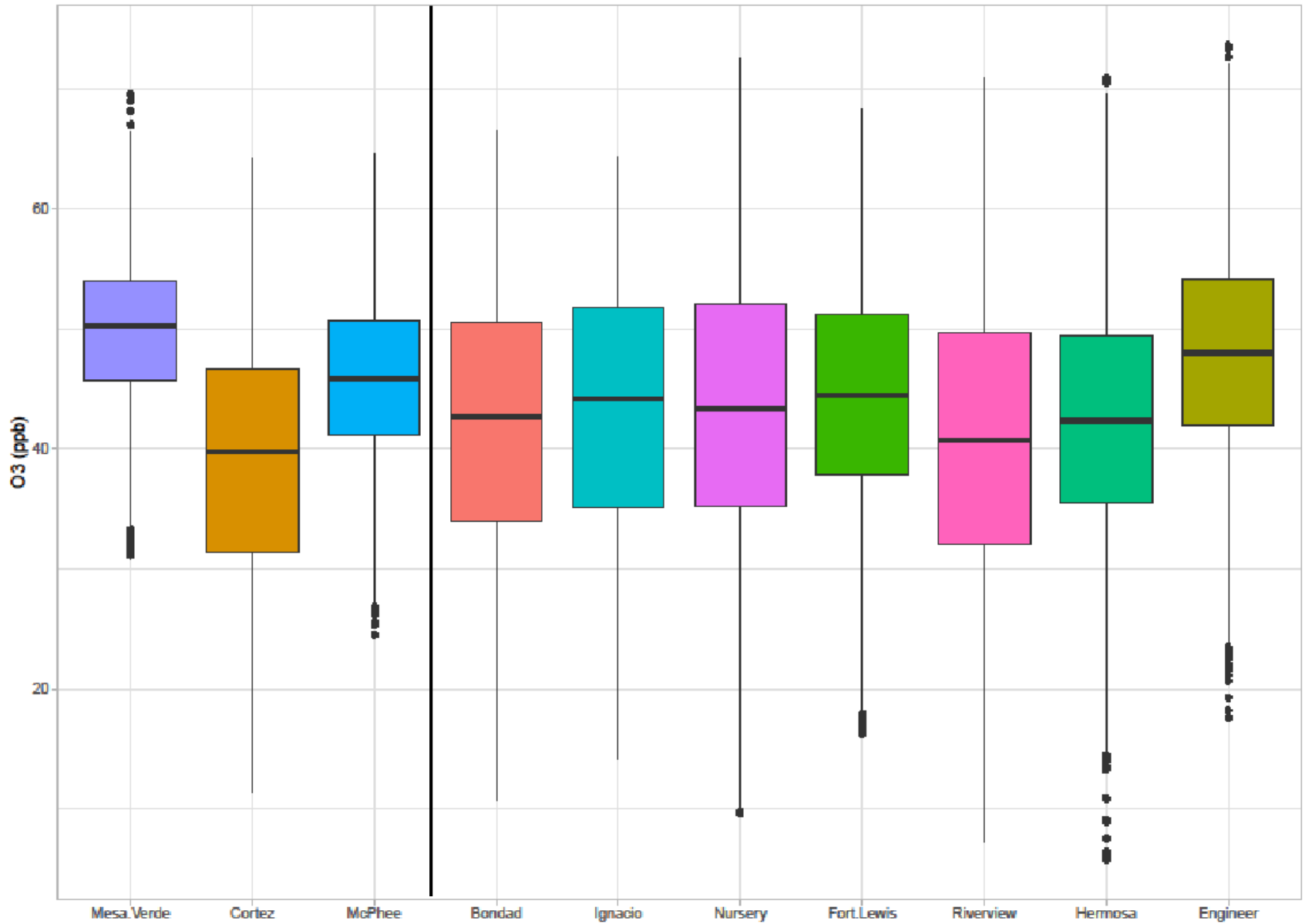


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Box Plot  
South to north

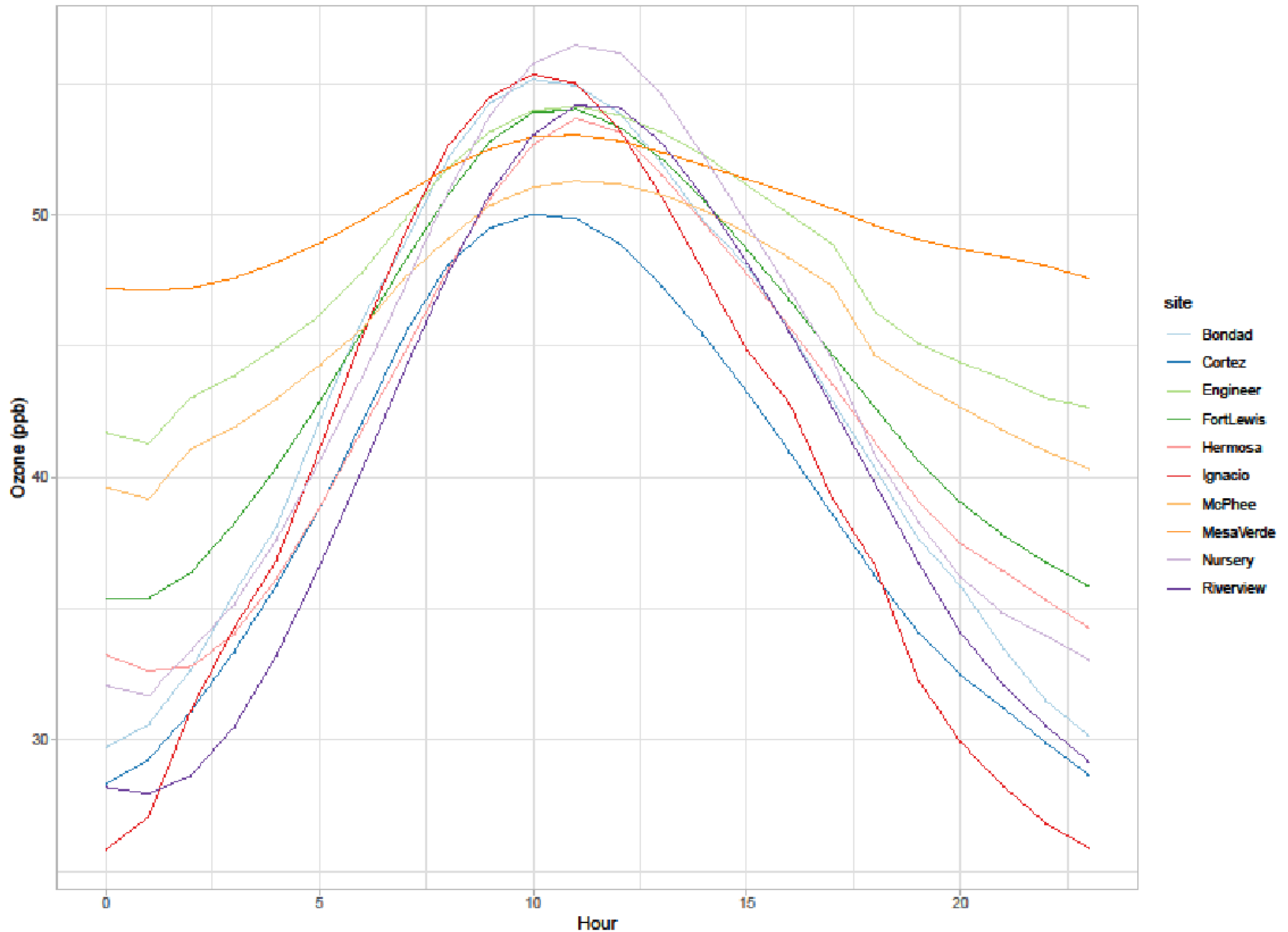


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Average ozone concentration  
per hour of day

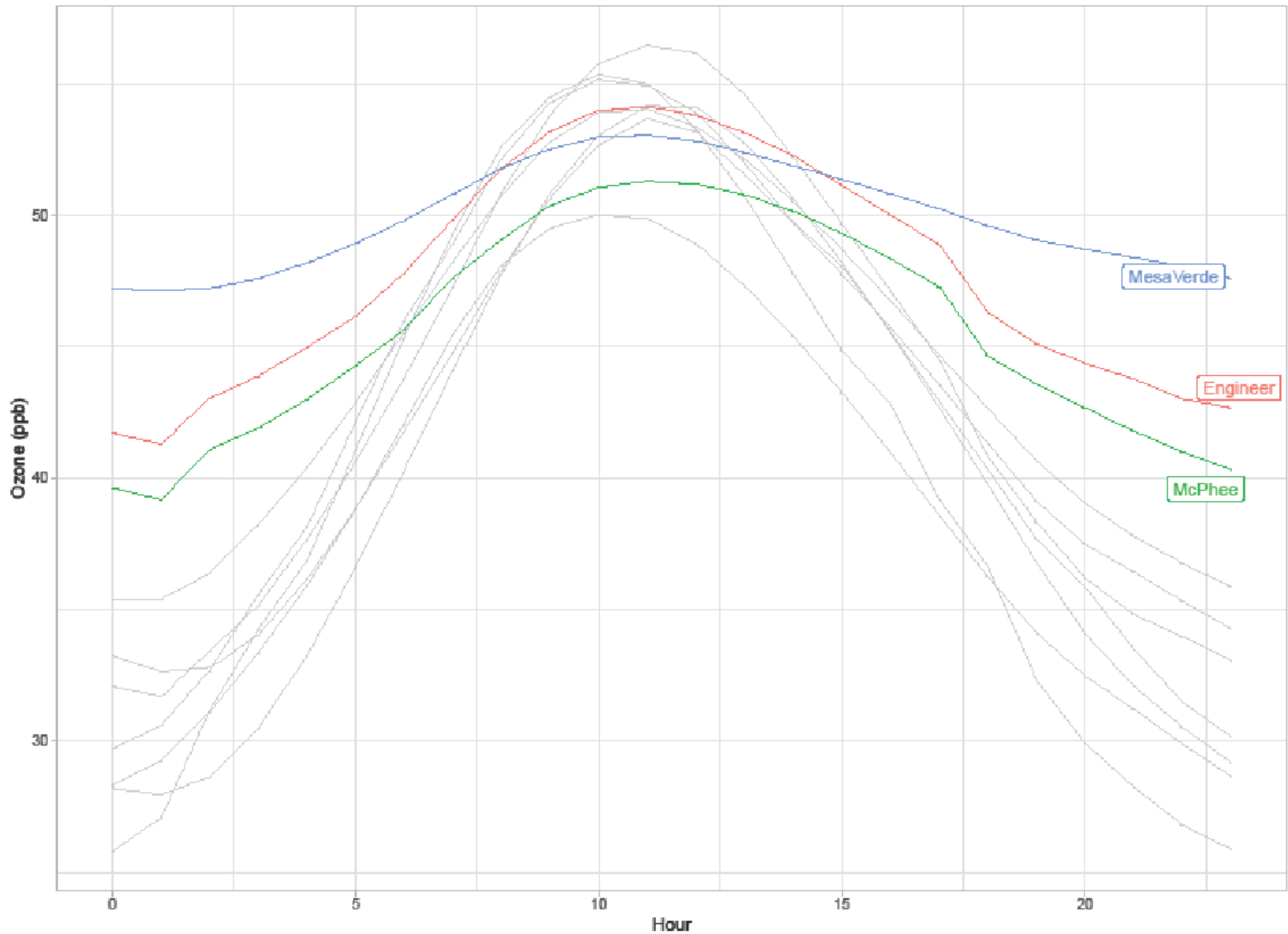


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Least Anthropogenic Influence  
per hour of day

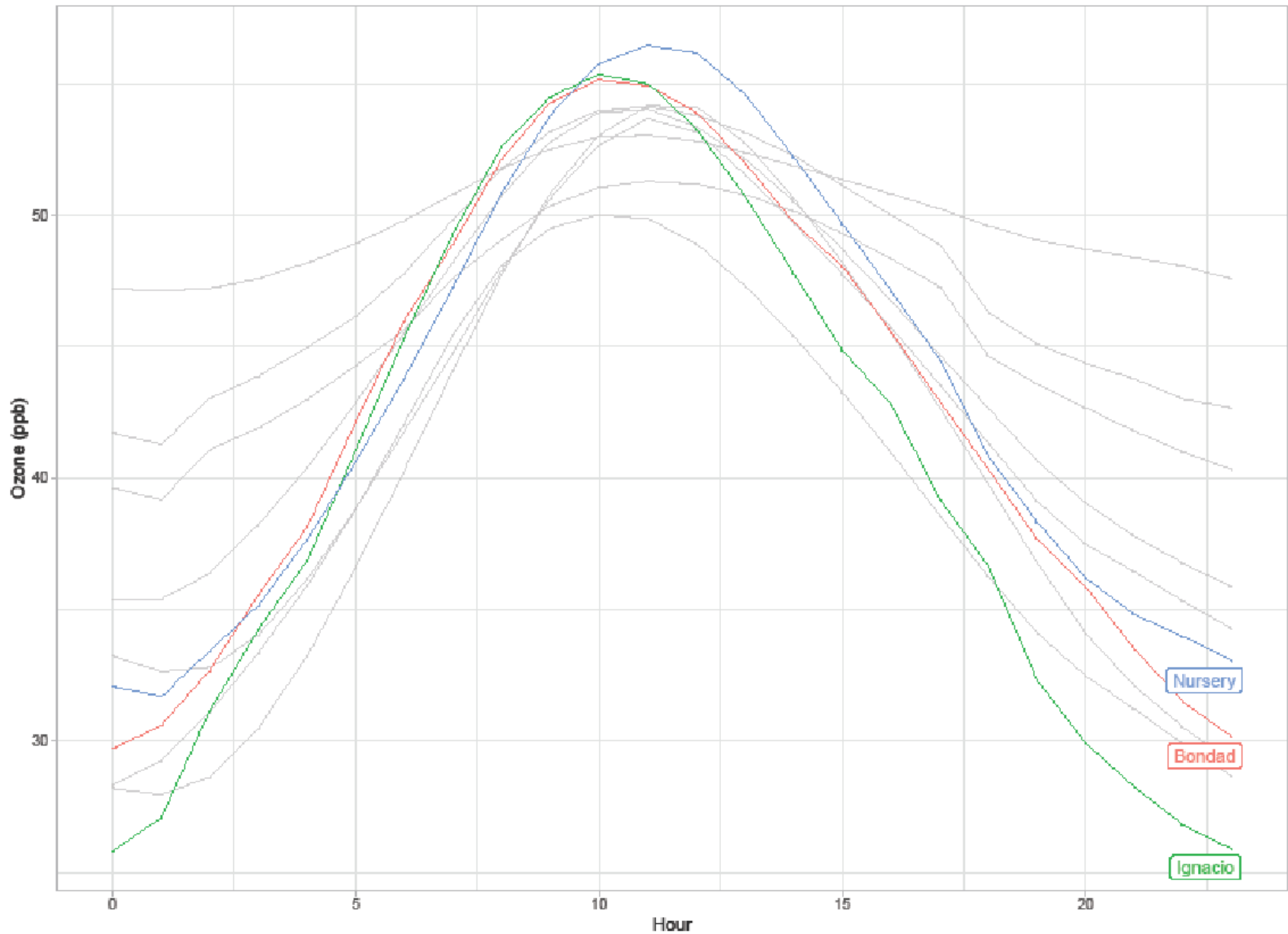


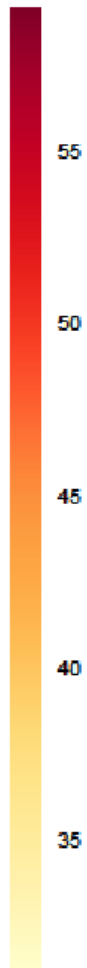
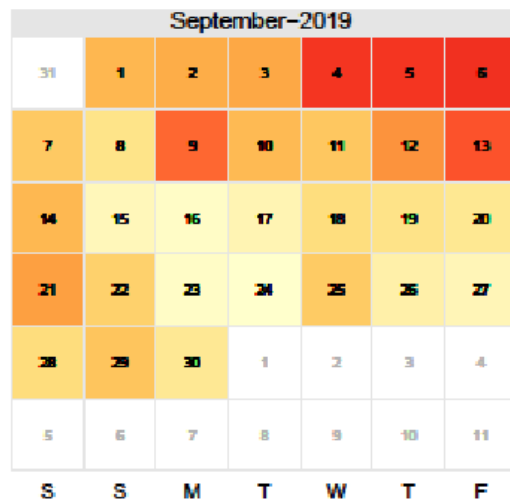
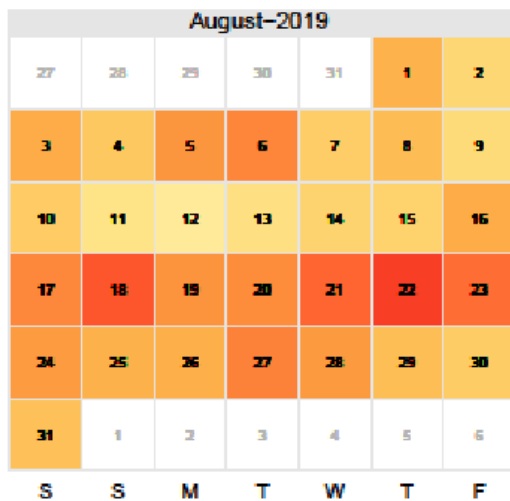
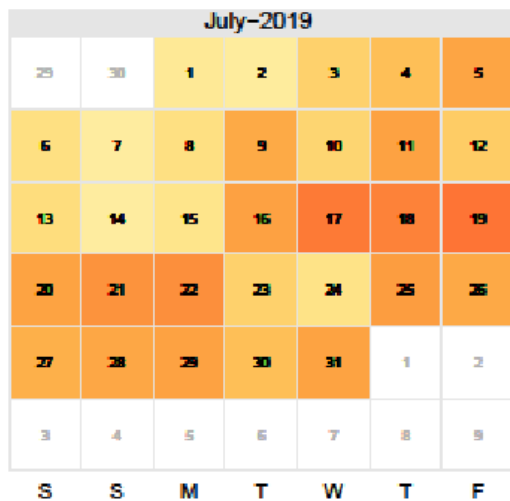
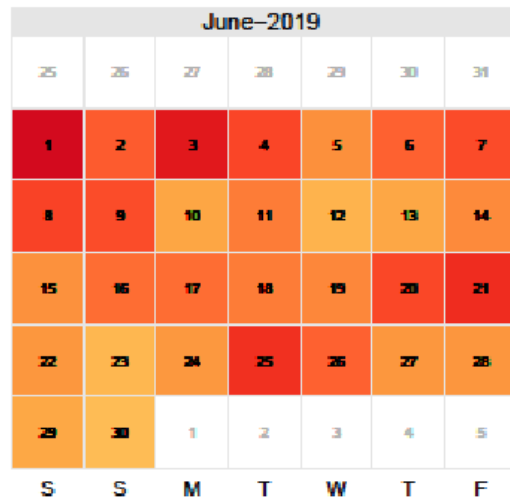
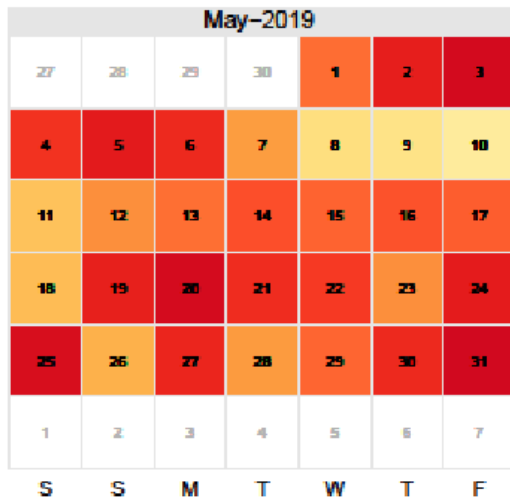
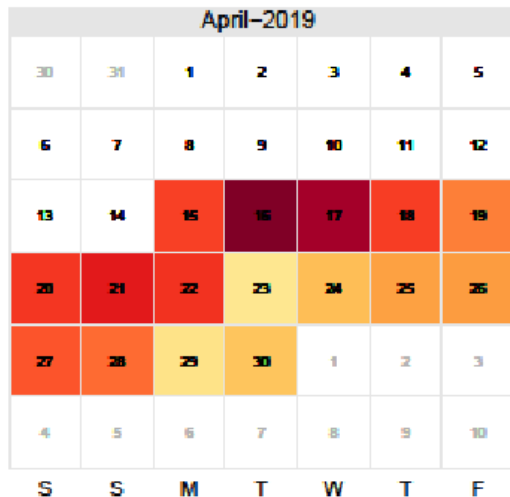
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# Highest Mid-day Averages per hour of day





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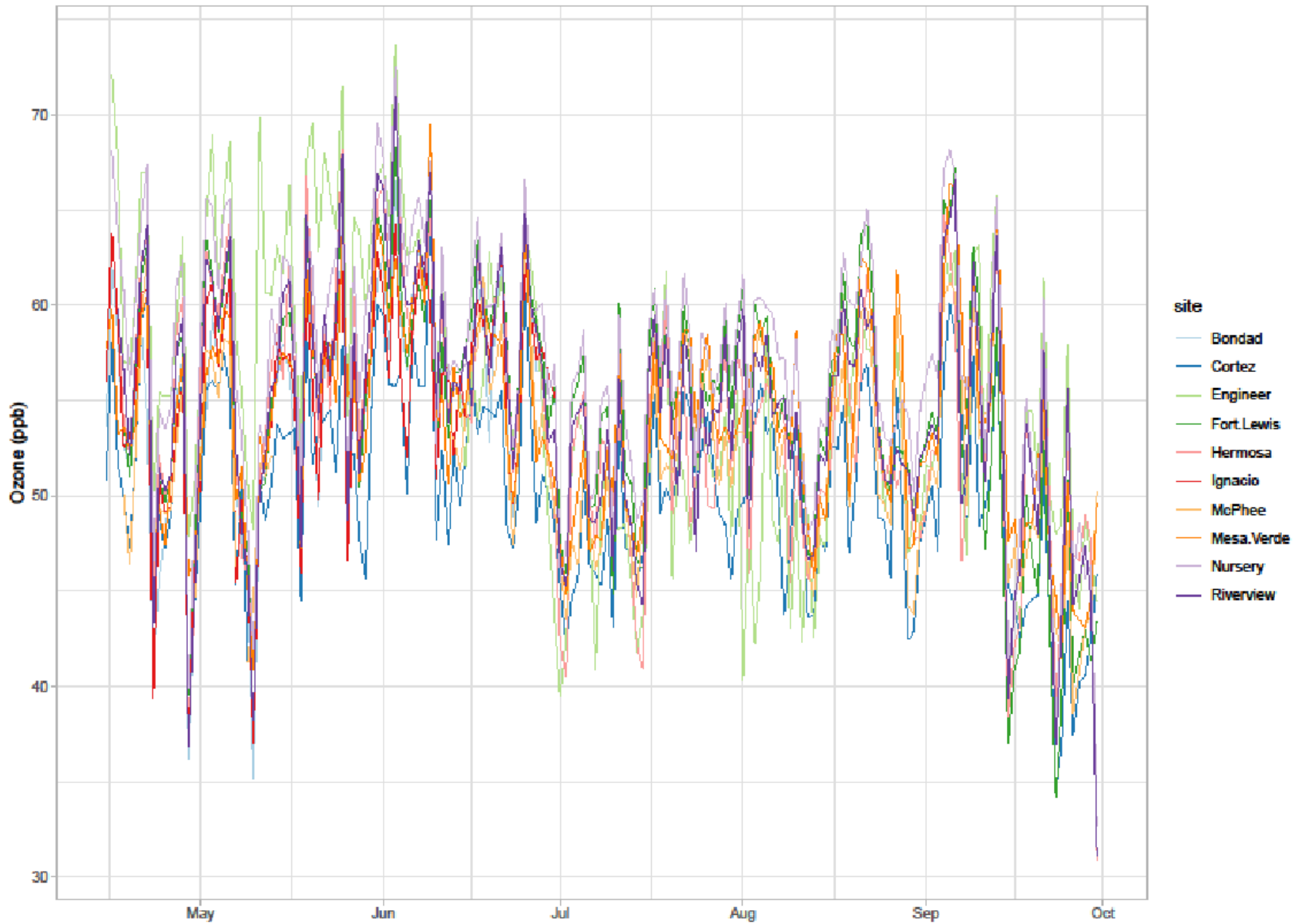
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# Daily Maximum 8-hour Concentrations

Entire Study Period



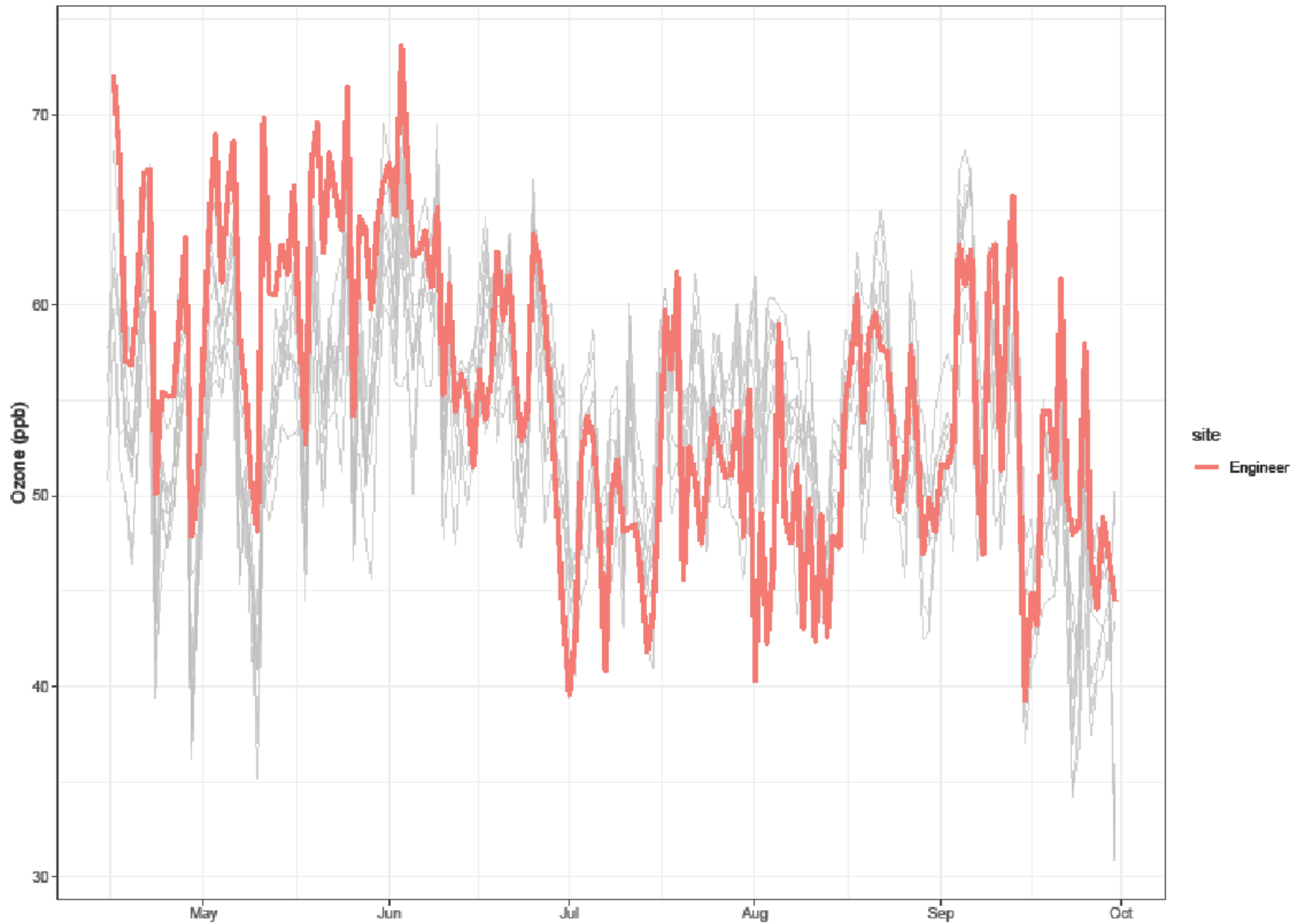
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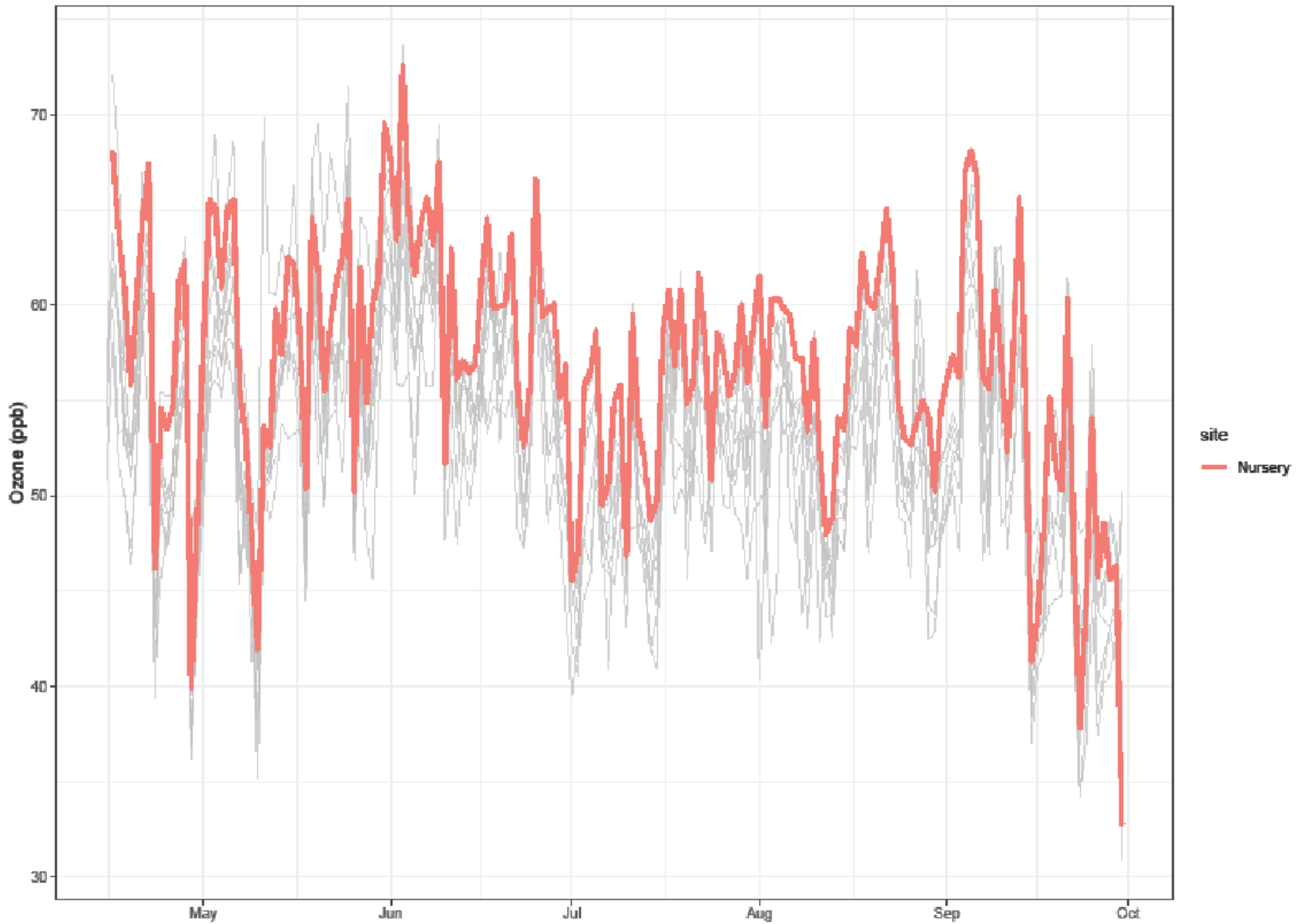
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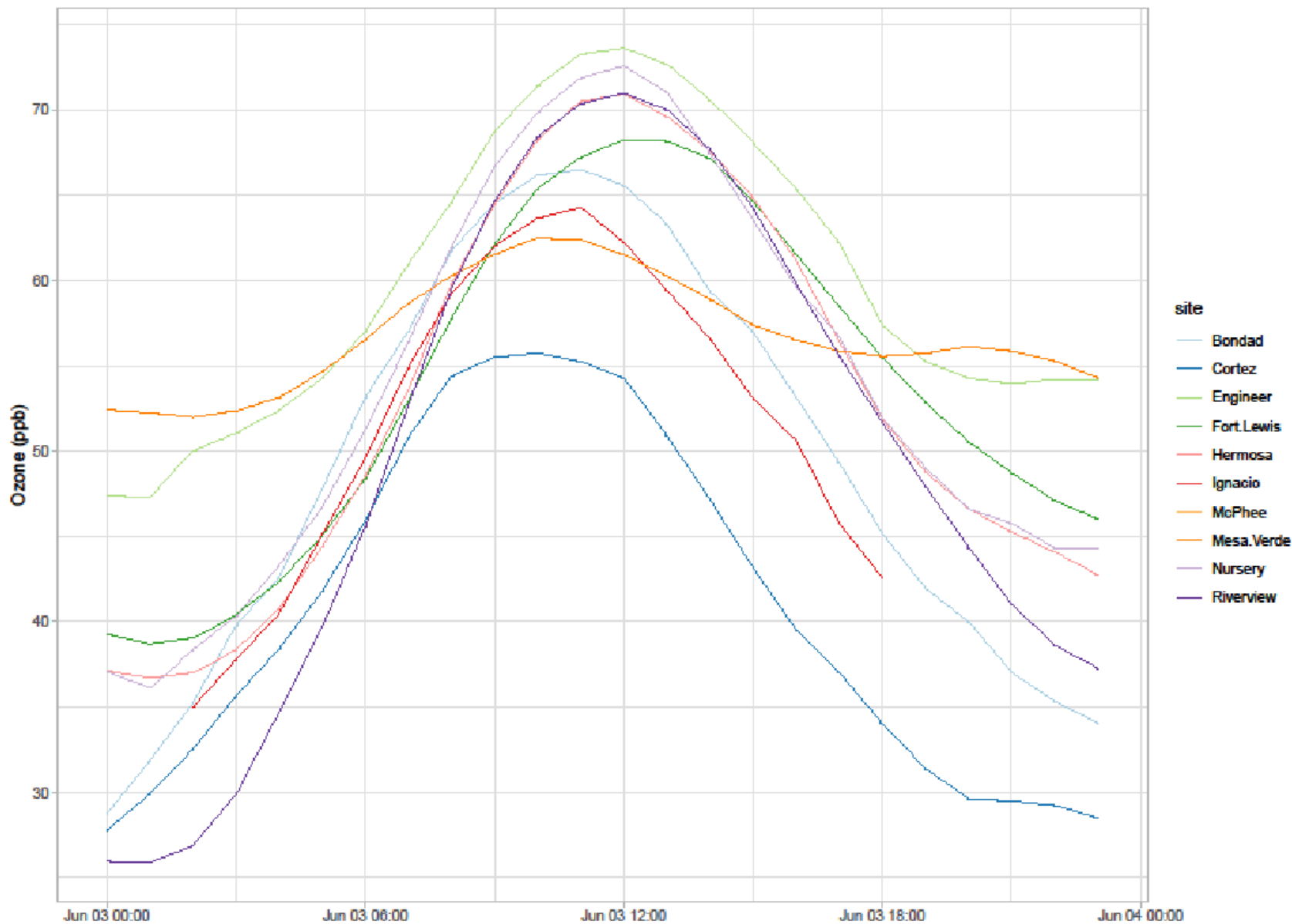
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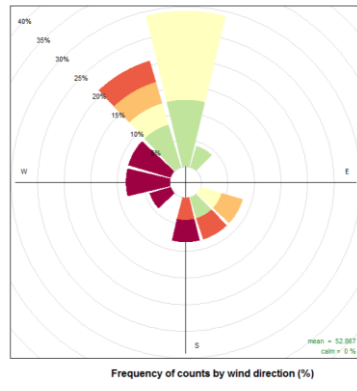
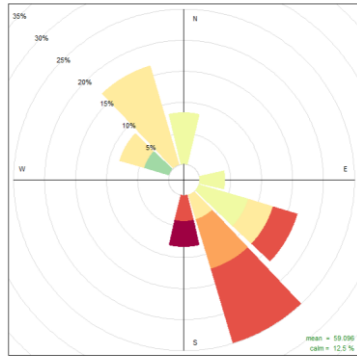
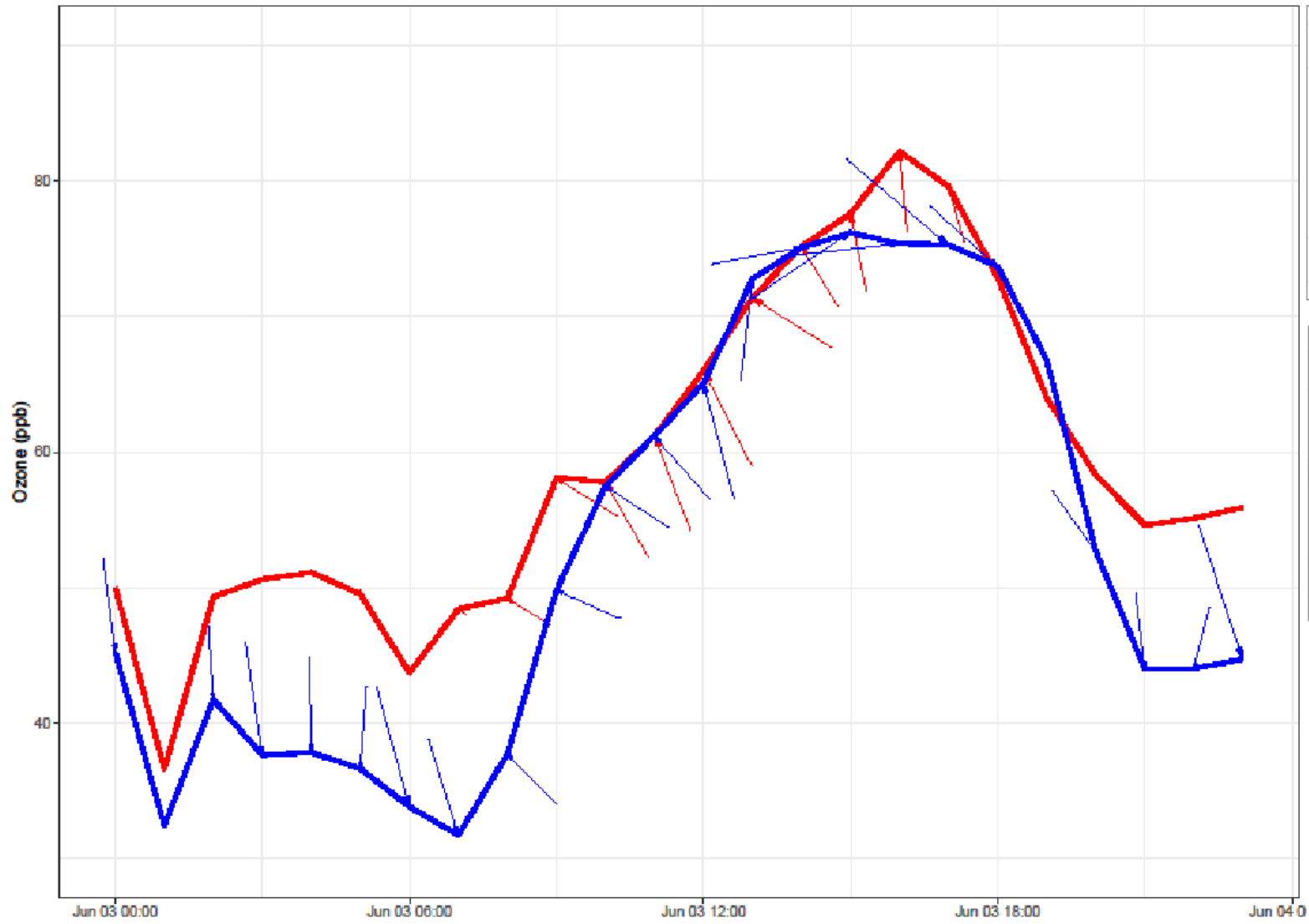
Entire Study Period



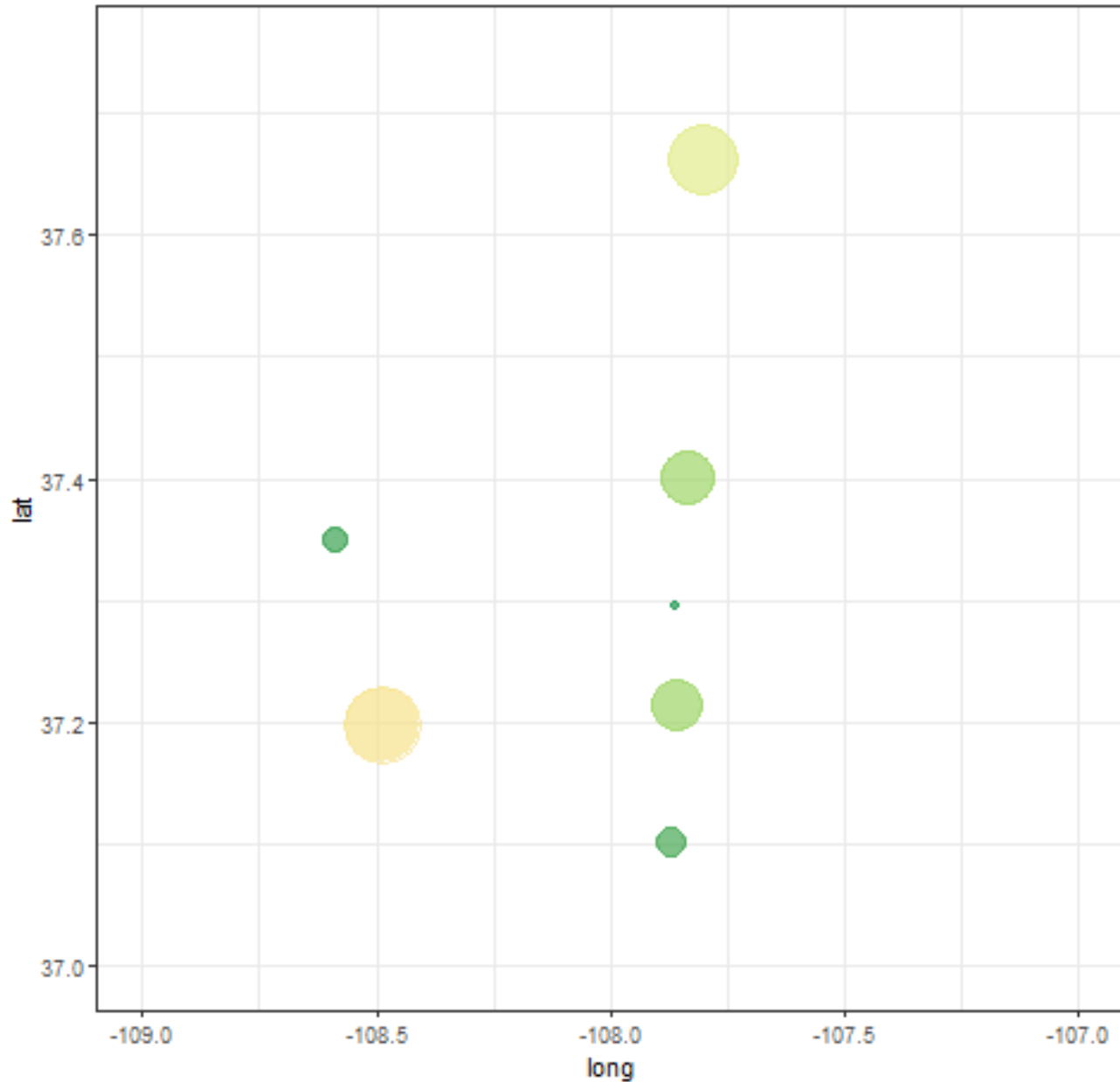
# 8 Hour Average Concentrations

June 3, 2019





Date: 2019-06-03 01:00:00

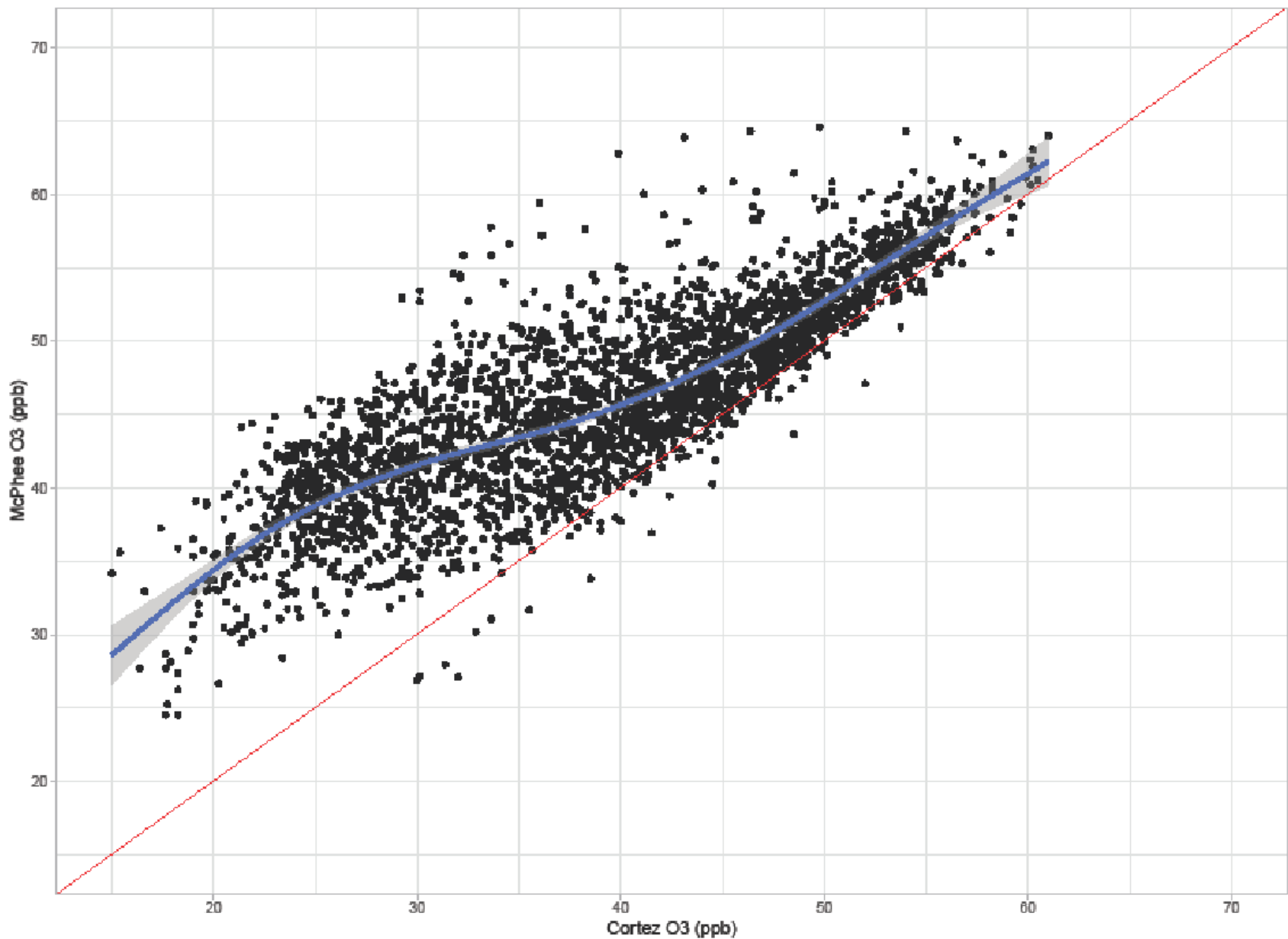


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McPhee and Cortez  
Regression Model



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