A Seasonal Perspective on Regional Air Quality in Central California (Phase 2)

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Acknowledgments

- Meteorological modeling (NOAA)
  - » Jim Wilczak, Jian-Wen Bao, Sara Michelson
- Emission inventory (CARB)
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  - » Central California Ozone Study / CARB
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Research Objectives

- Compare seasonal perspective to episodic modeling approach used for air quality planning

- Diagnose ozone sensitivity to precursor emissions:
  - » Benefits of VOC vs NO_x control
  - » Effects of local vs upwind sources
  - » Effects on 1-h vs 8-h ozone levels

Phase 1

- 15-day simulation (7/24-8/7/2000)
- Used 96x117 SARMAP domain
- Developed new motor vehicle & biogenic emission estimates

Phase 2

- 4-month simulation (6/2-9/26/2000)
- Used larger CCOS domain (190x190)
- Used emission estimates provided by CARB
- Driven by NOAA MM5 unnudged simulation
- EPA CMAQ model with 27 vertical layers, 4 km horizontal resolution
- SAPRC99 chemical mechanism

Presentation Outline

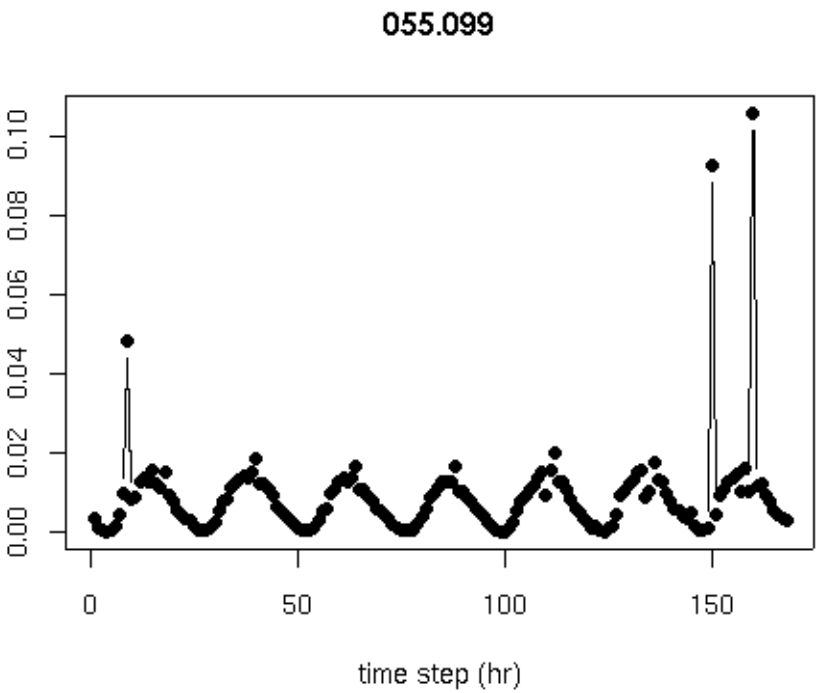
- Emission inventory (Rob Harley)
- AQ model performance evaluation for 120-day summer season (Ling Jin)
- Model probing tools for diagnosing emission sensitivity (Nancy Brown)
  - » Direct decoupled method
  - » Process analysis

Emission Inventory Issues

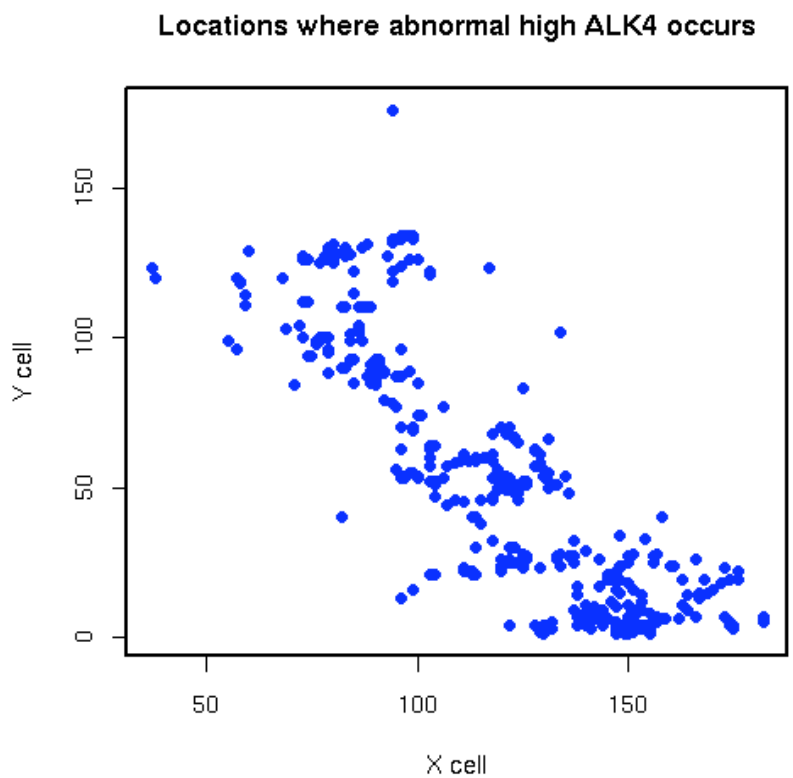
- We had large & unanticipated amount of extra work to prepare model-ready input files
  - » Emission spikes in on-road inventory
  - » Forest fires emissions don’t include VOC speciation, diurnal distributions, plume rise
  - » Some double-counting of fire emissions in Tuolumne and part of Fresno county

Emission Inventory Issues

Spikes in VOC emissions from on-road vehicles

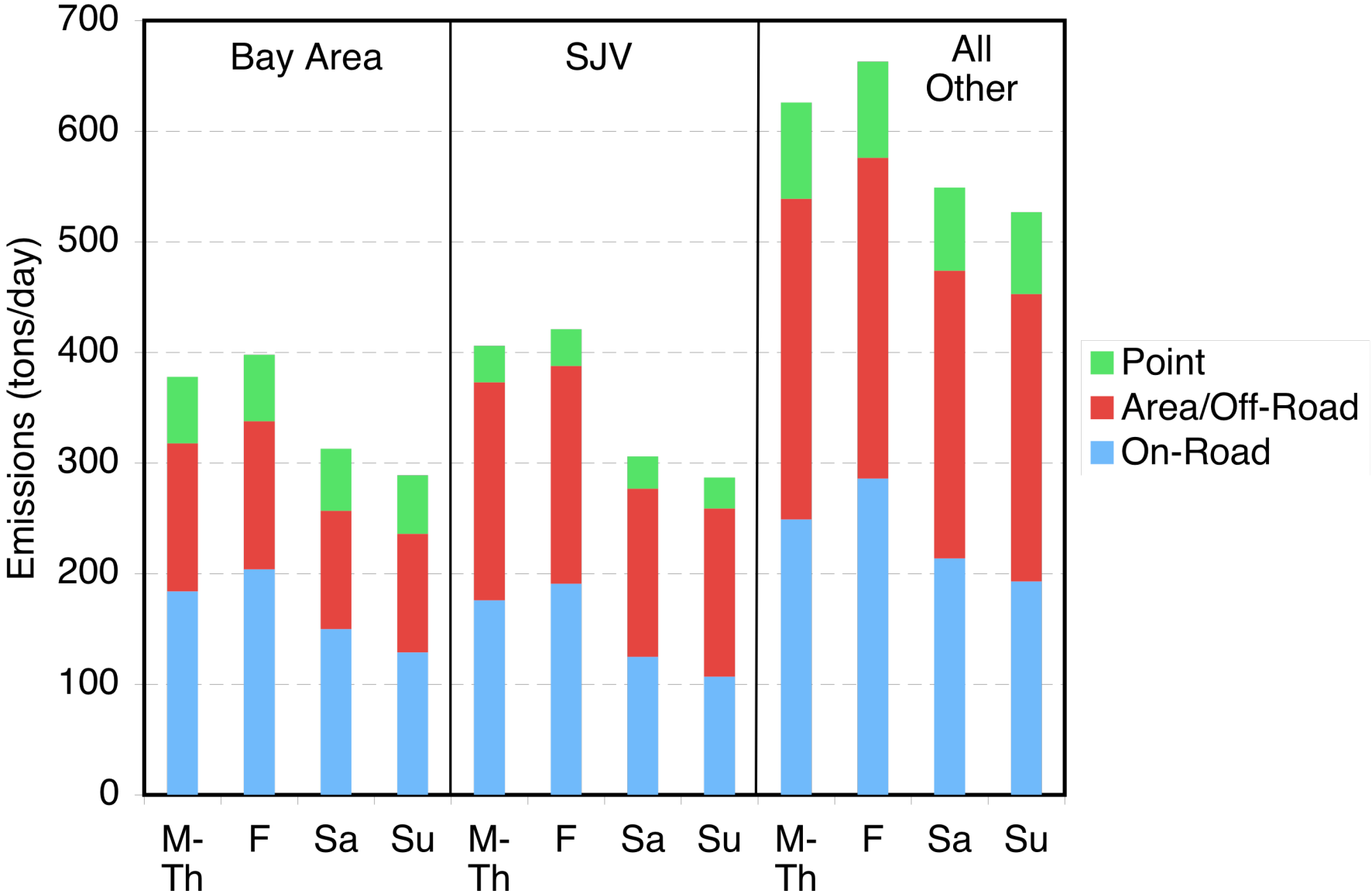


ALK4 on-road emissions (mol/s) versus time in one grid cell

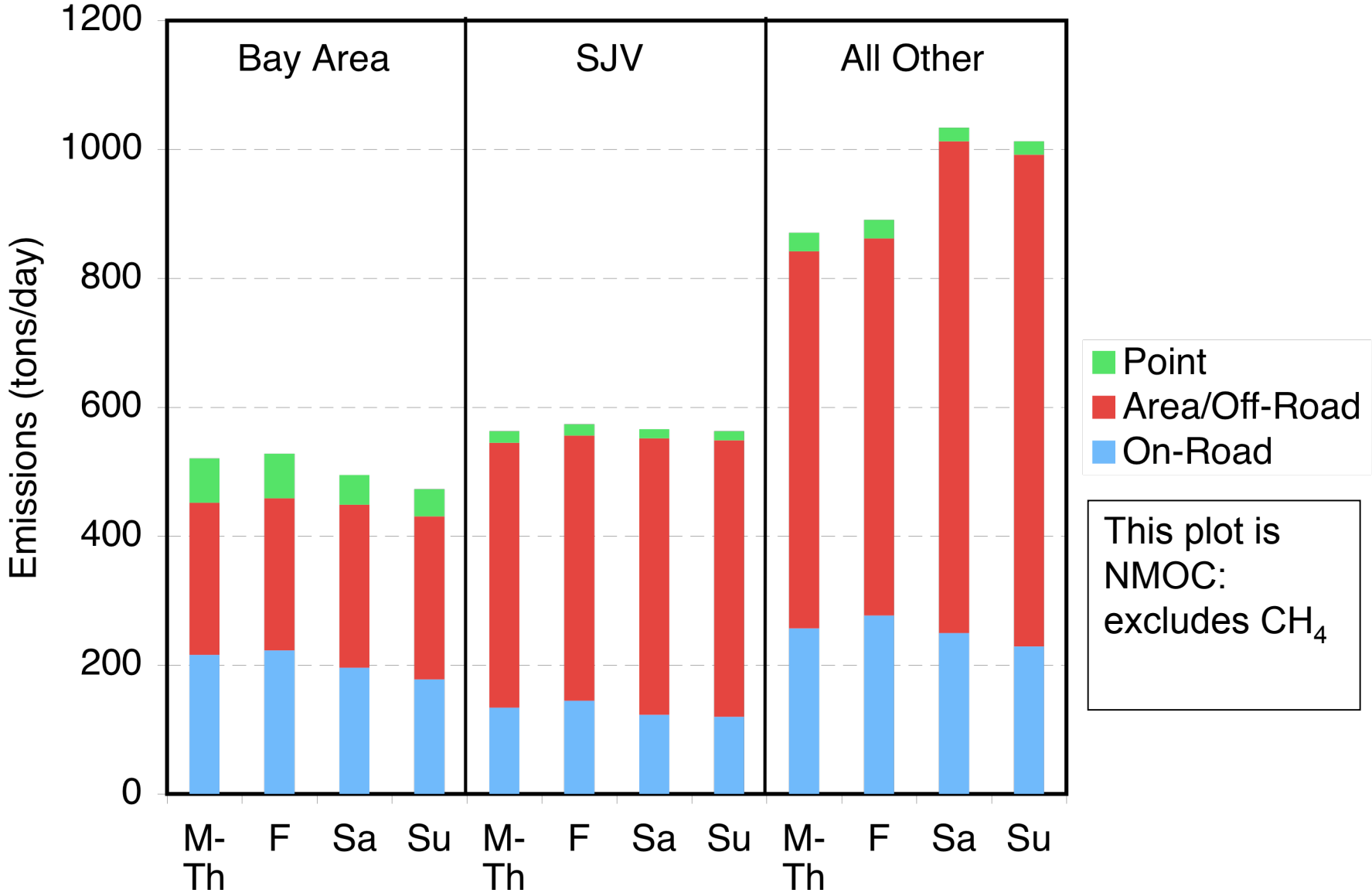


Grid cells with spikes in on-road emissions

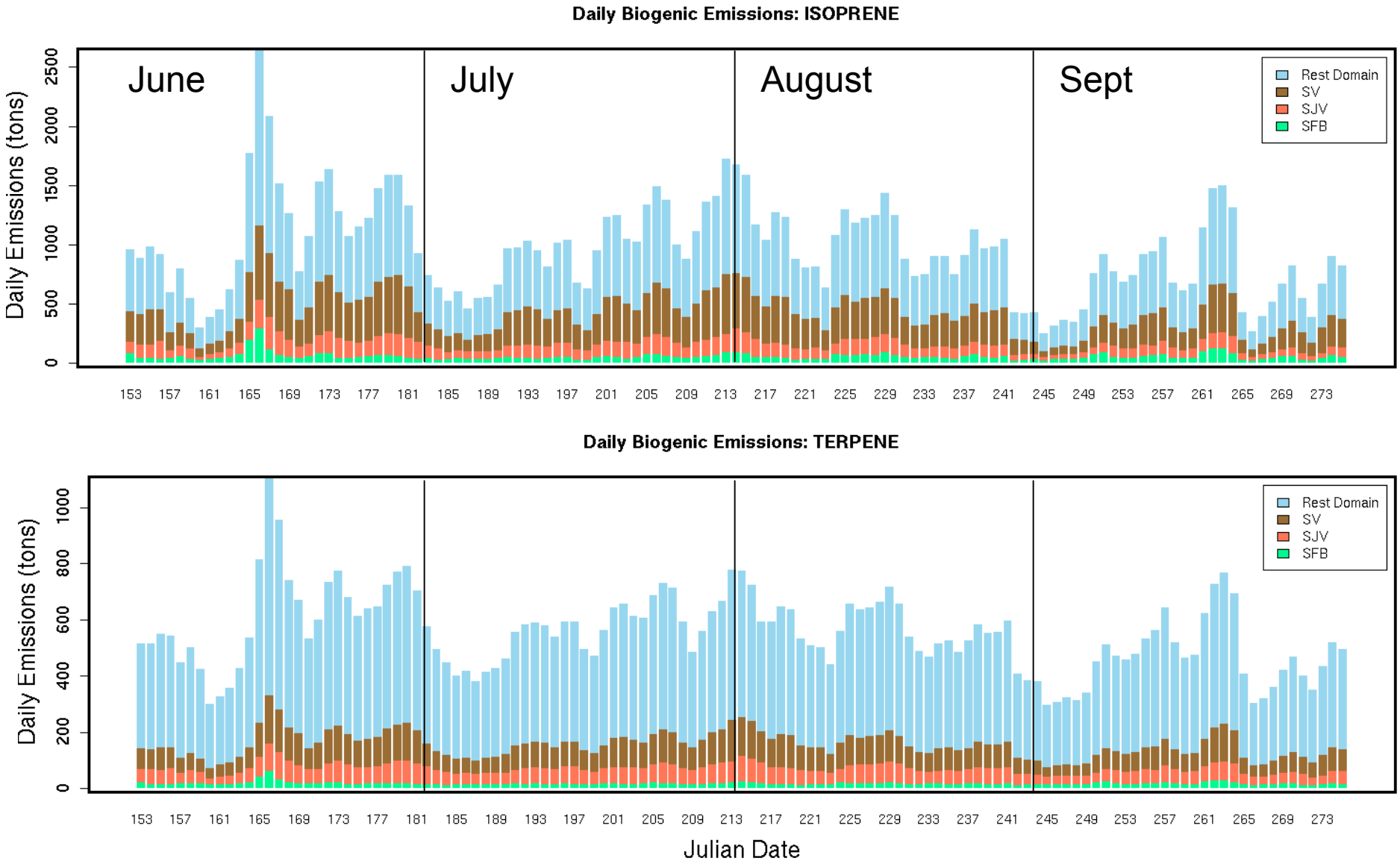
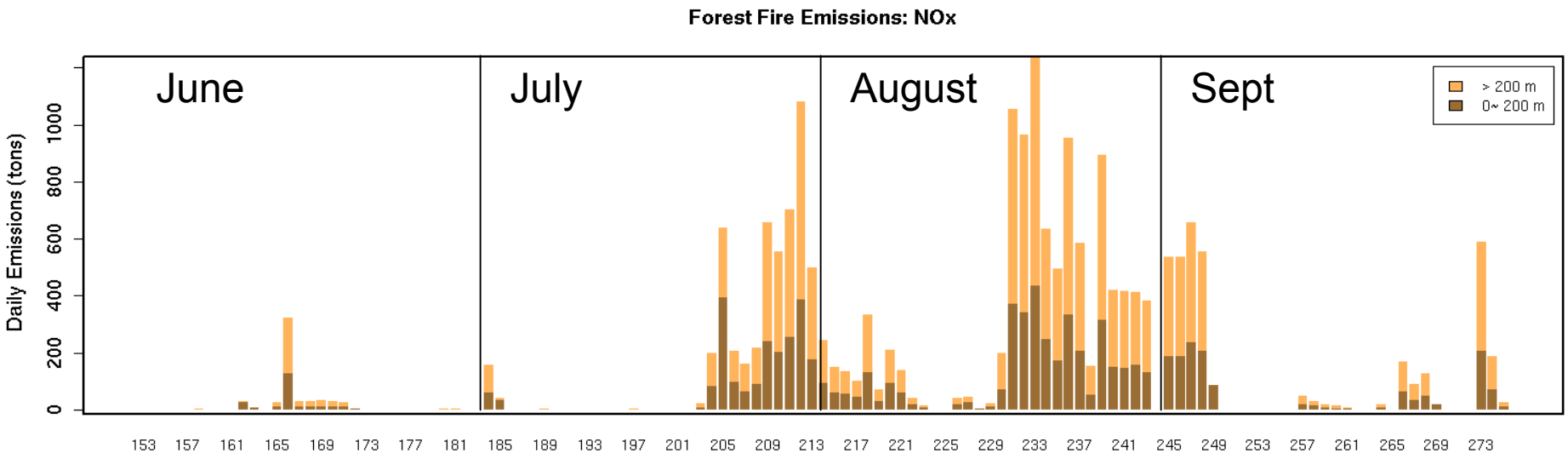
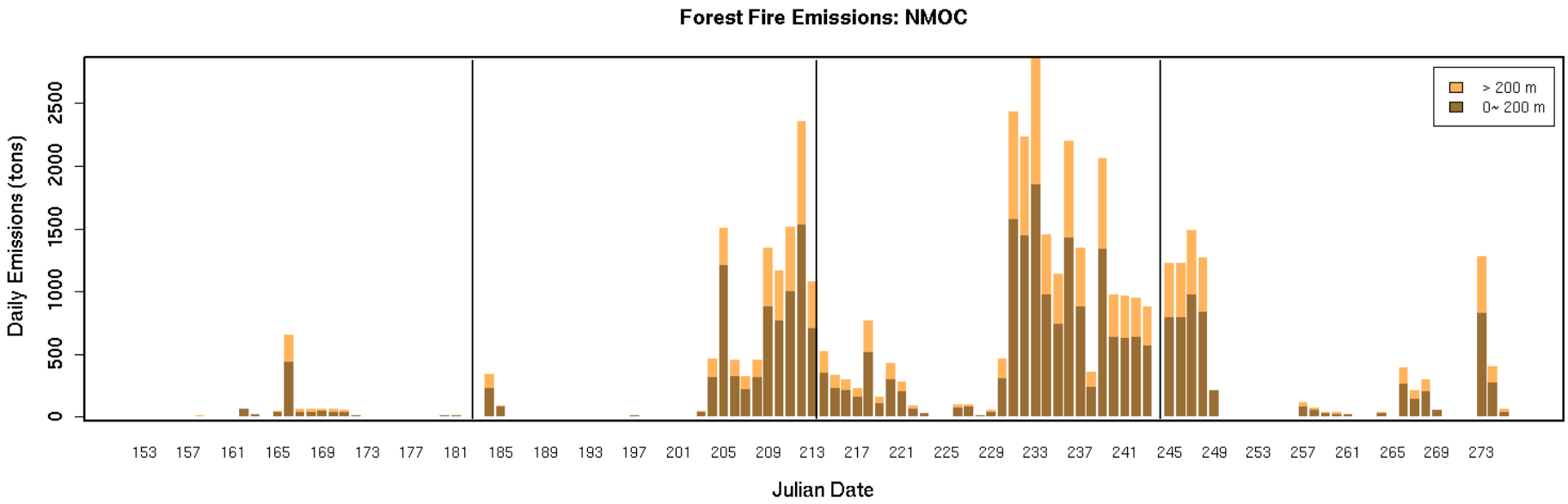
Anthropogenic NO_x Emissions



Anthropogenic VOC Emissions



Biogenic VOC Emissions



Forest Fire Emissions