

Variations in the Sources of CO₂ Emissions in the Los Angeles Megacity from Atmospheric Measurements

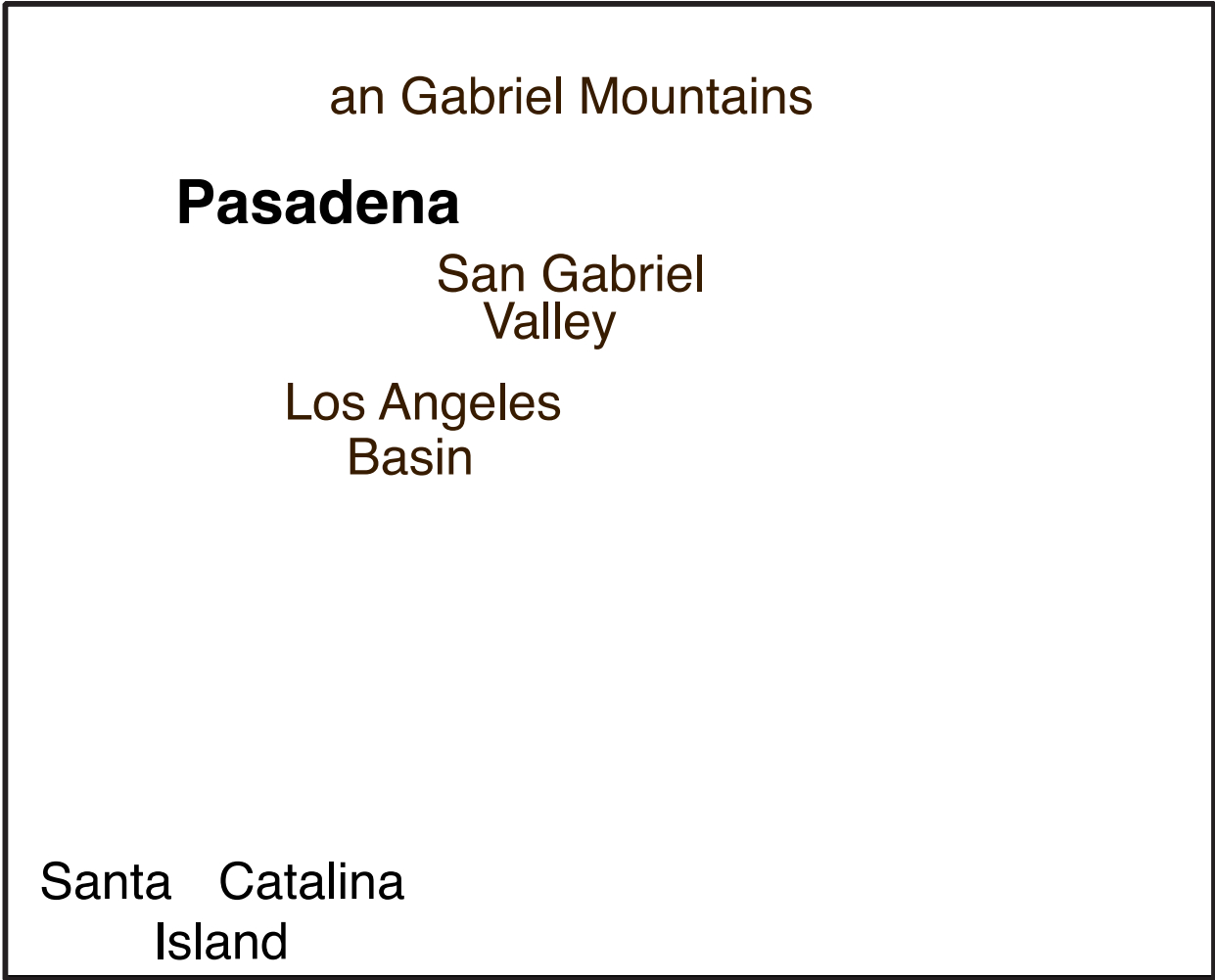
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We thank the Keck Institute for Space Studies and the California Air Resources Board for funding.

Outline

- Motivation
 - understand patterns and trends in CO₂ emissions in relation to natural and anthropogenic processes
- Summary of long-term trends
 - mid-afternoon $\Delta^{14}\text{C}$, $\delta^{13}\text{C}$ from flask samples
 - source attribution
 - long-term and seasonal trends
- Extend this analysis to different parts of the day
 - continuous CO_xs/CO₂x_s as proxy for $\Delta^{14}\text{C}$
 - diurnal as well as seasonal patterns of source attribution



San Gabriel Mountains

Pasadena

San Gabriel
Valley

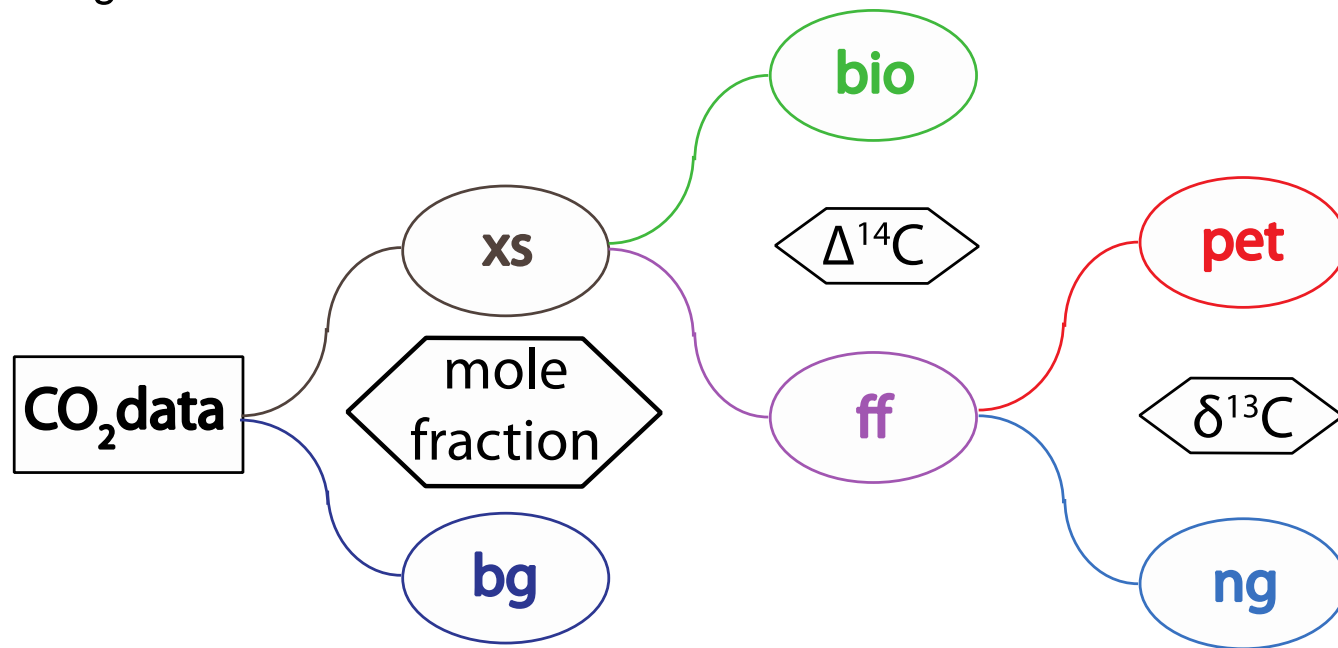
Los Angeles
Basin

Santa Catalina
Island

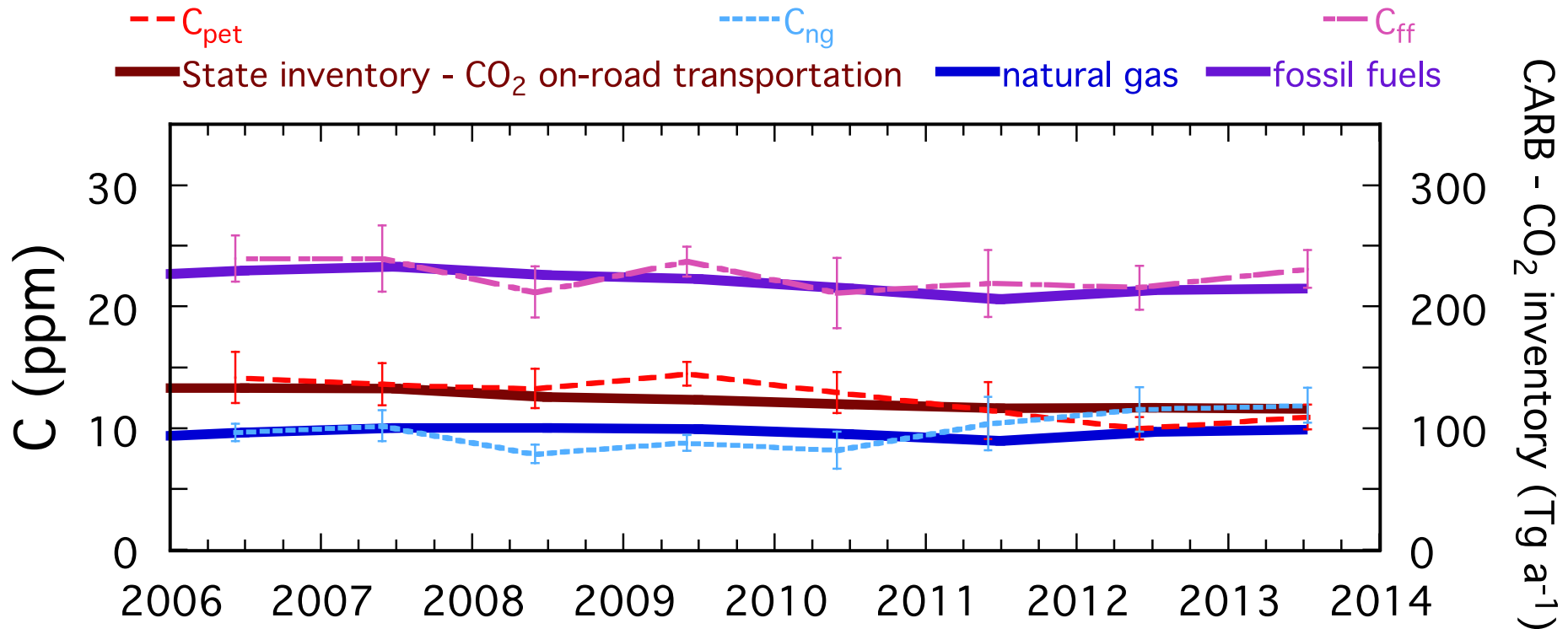
118°30 118°0 117°30 117°0'W

Schematic of information used in attribution

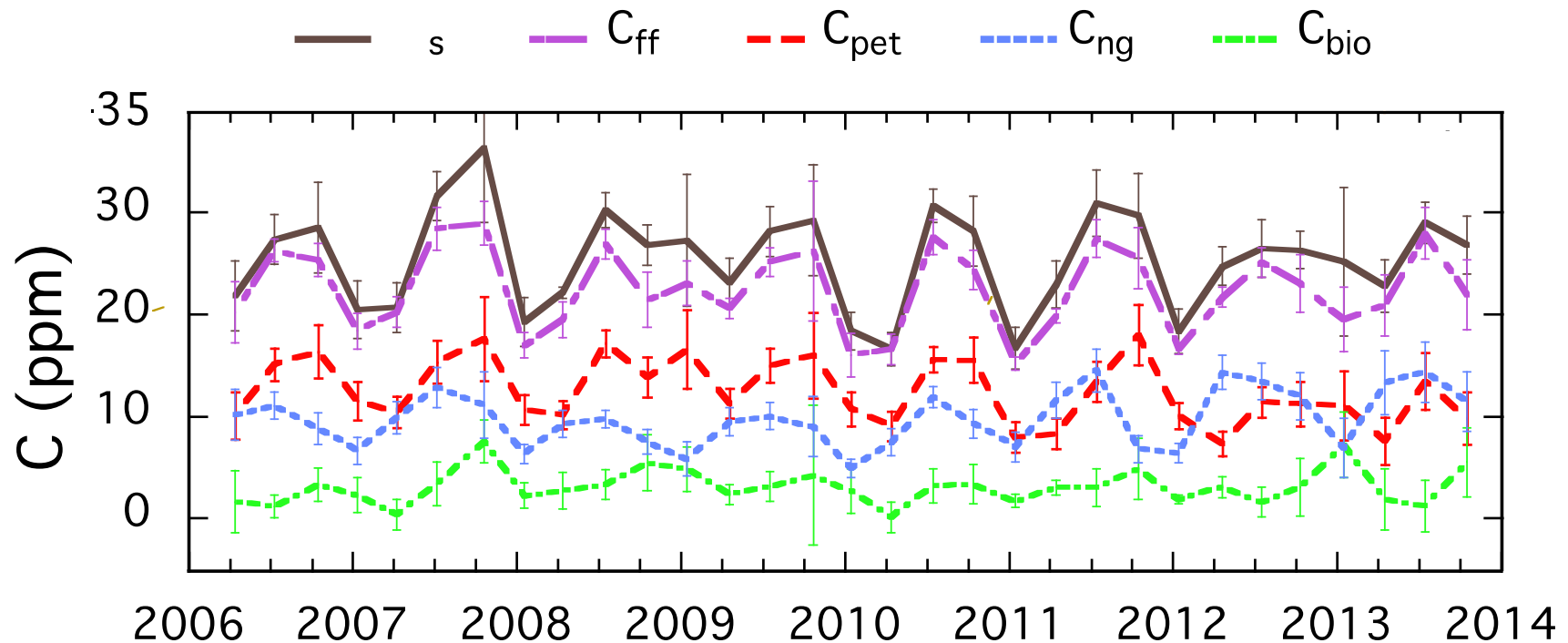
fig02

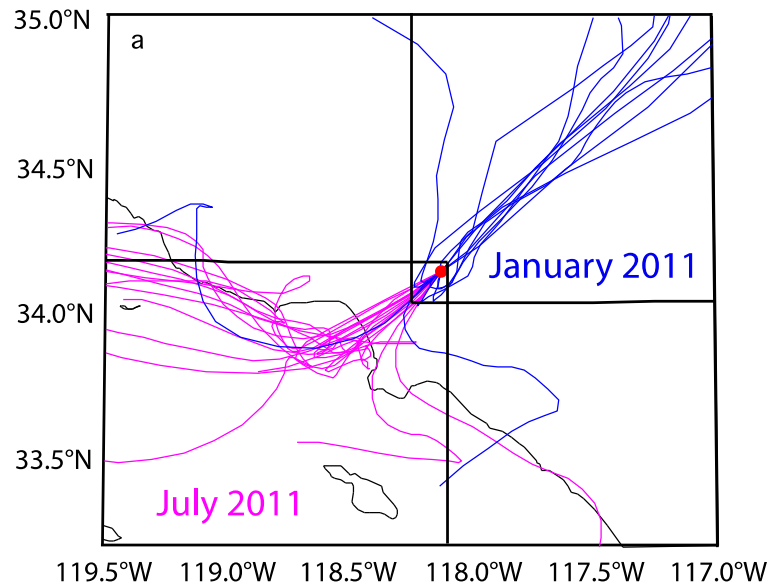


Comparison of Pasadena top-down data with State bottom-up inventory



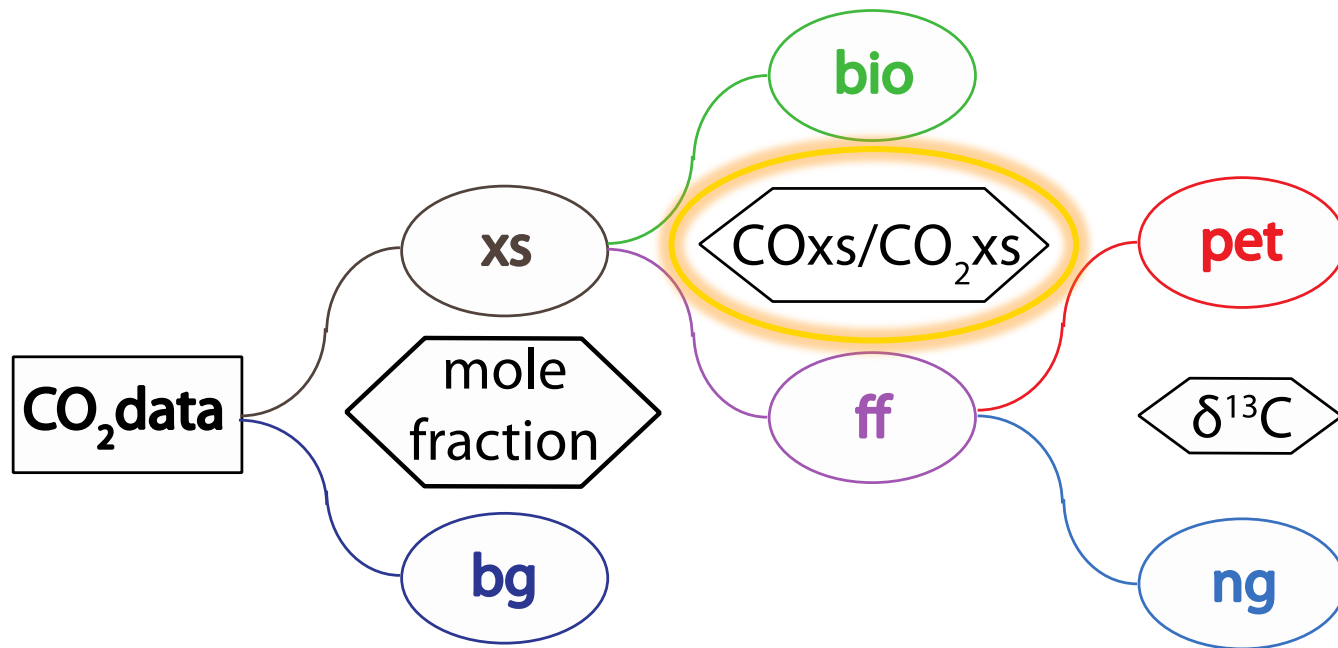
Attribution of sources at mid-day using $\Delta^{14}\text{C}$ and $\delta^{13}\text{C}$



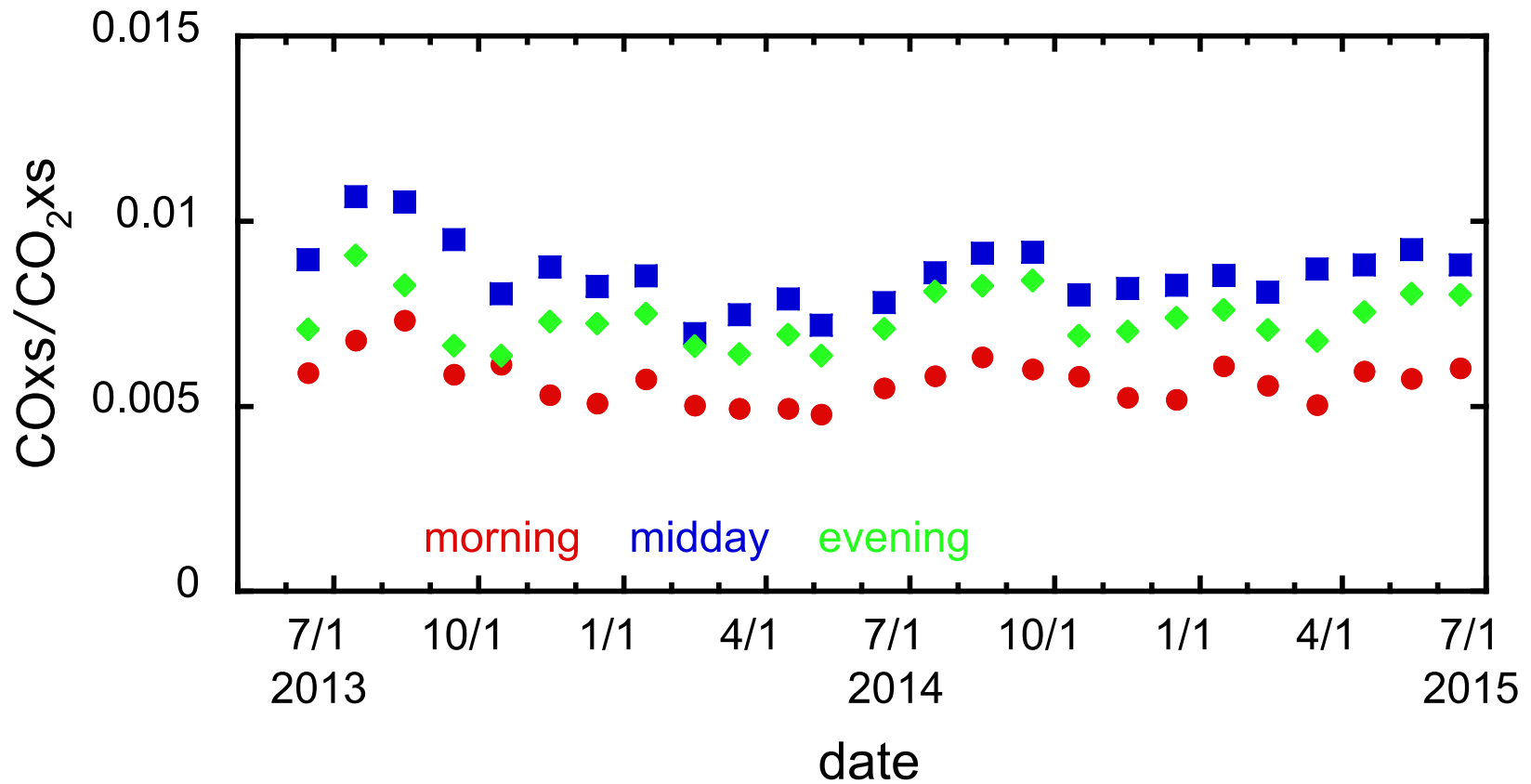


mg (kg)

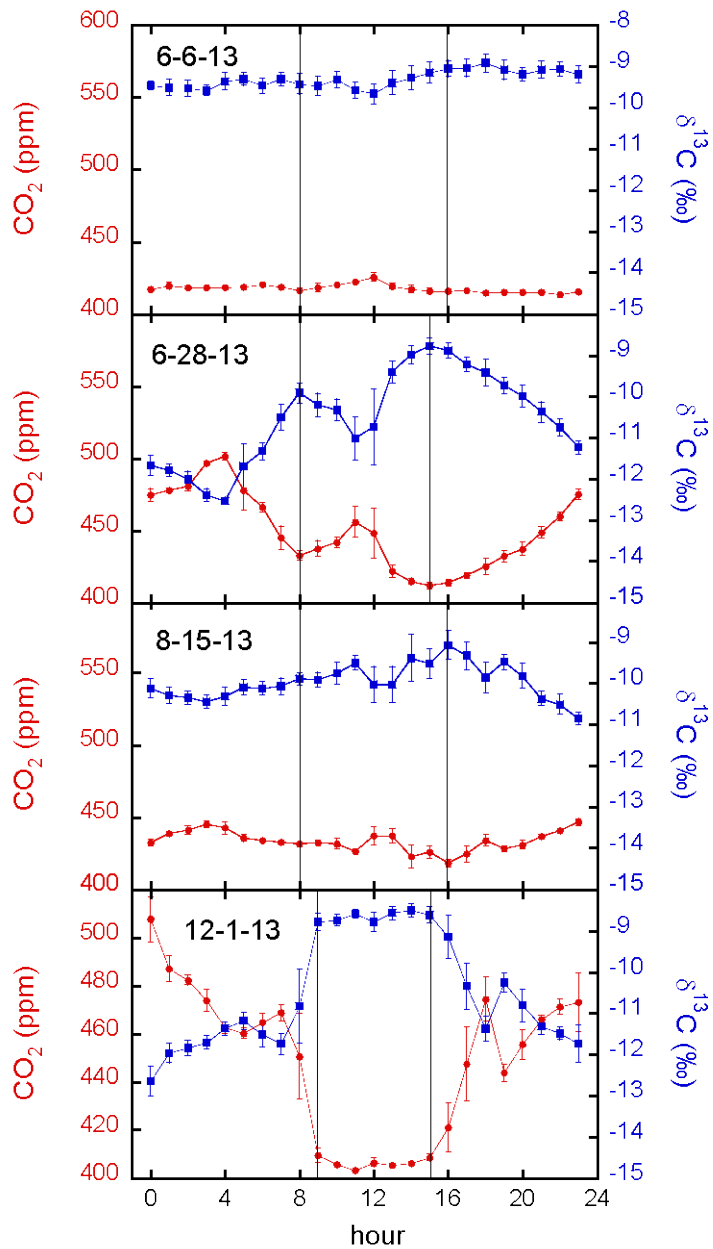
Now look at diurnal variations
- using CO₂xs, COxs, and δ¹³C



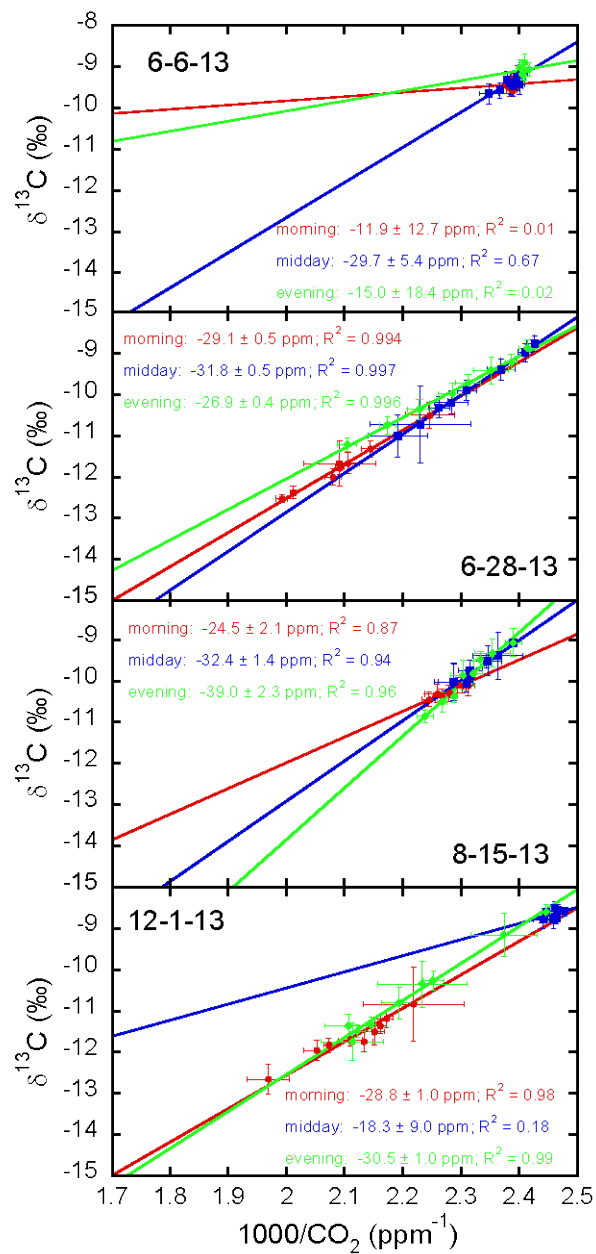
Monthly Diurnal Variations in $\text{CO}_x\text{s}/\text{CO}_2\text{s}$



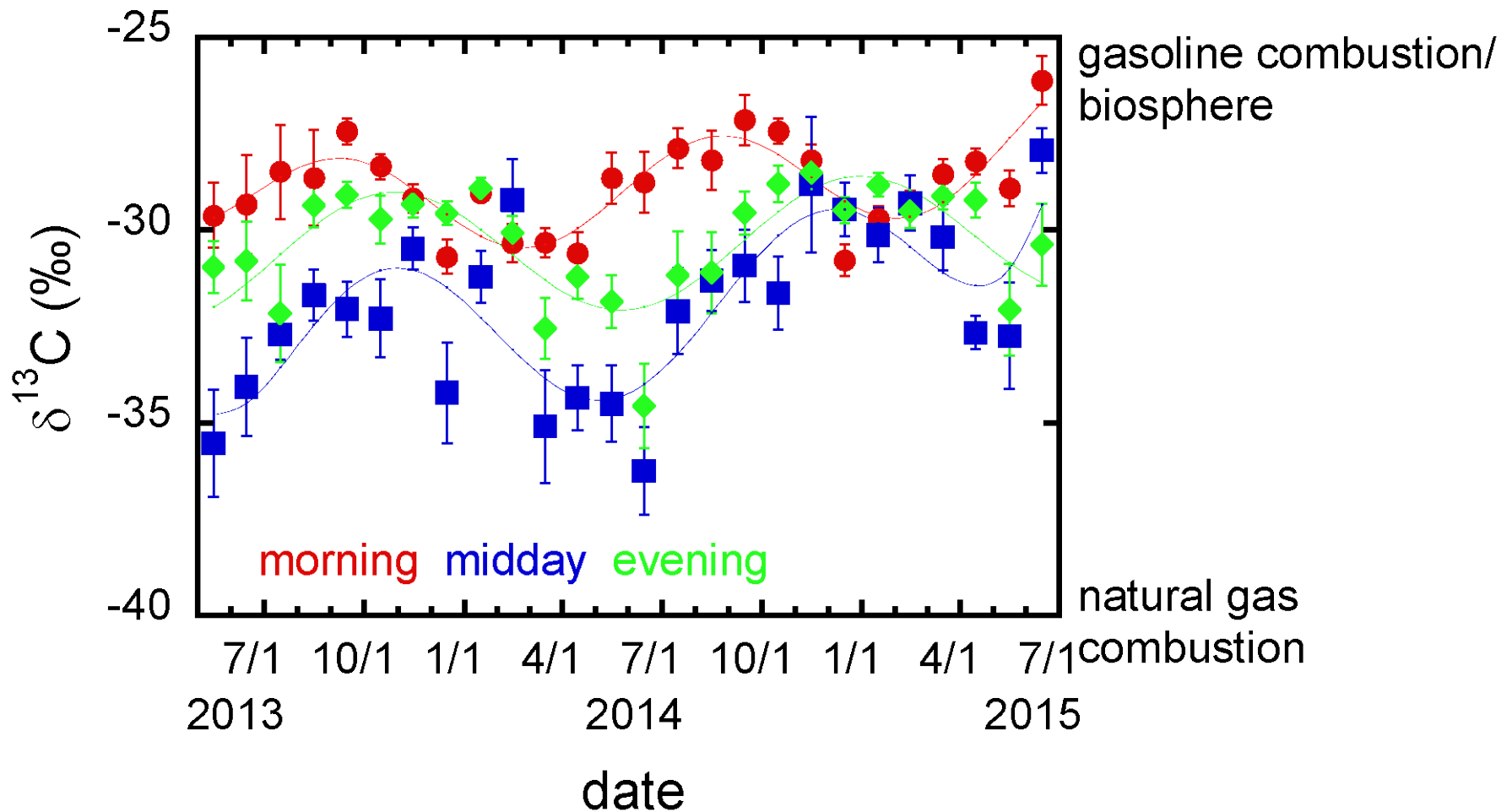
Diurnal Plots



Keeling Plots



Monthly Average Keeling Plot Intercepts



Source attribution

5

evening

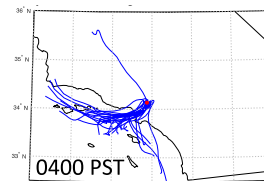
2013

2014
date

2015

Source attribution compared with wind patterns

July 2013



5

evening

2013

2014
date

2015

Conclusions

- Long-term, mid-afternoon CO₂ff record consistent with bottom-up State inventory
- Seasonal patterns in the CO₂ emissions due to seasonal variations in wind direction
- Seasonal patterns vary for different times of day
- Wind patterns similar diurnally – therefore varying observed CO₂ emissions patterns may indicate different proportions of sources at different times of day

An aerial photograph of a coastal city, likely San Francisco, showing the city grid, the bay, and the surrounding mountains. The text "Thank you!" is overlaid in the upper center.

Thank you!

We thank the Keck Institute for Space Studies and the California Air Resources Board for funding.