

Measuring $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ of CO_2 at **Harvard Forest** using a Quantum Cascade Laser Spectrometer

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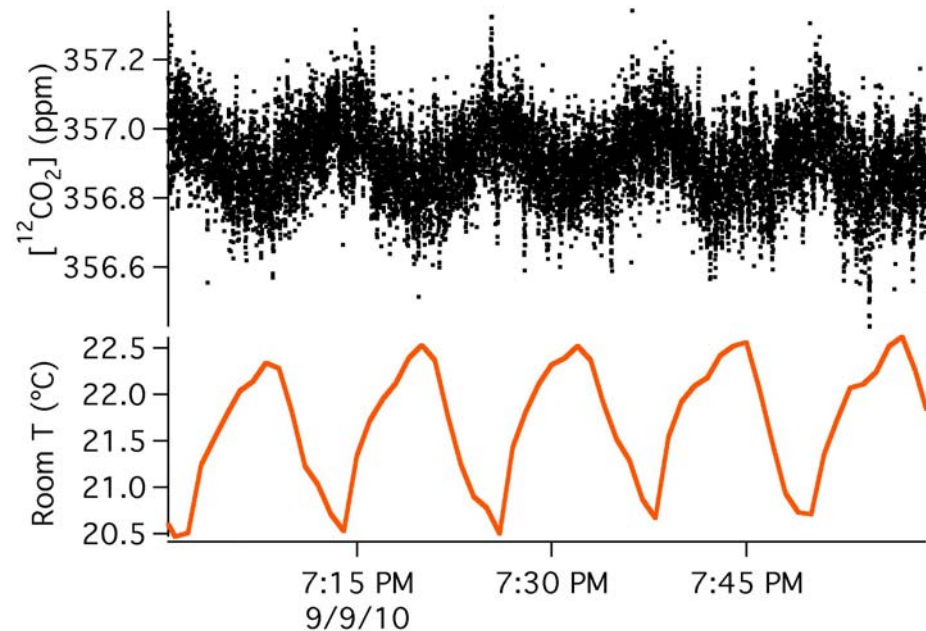
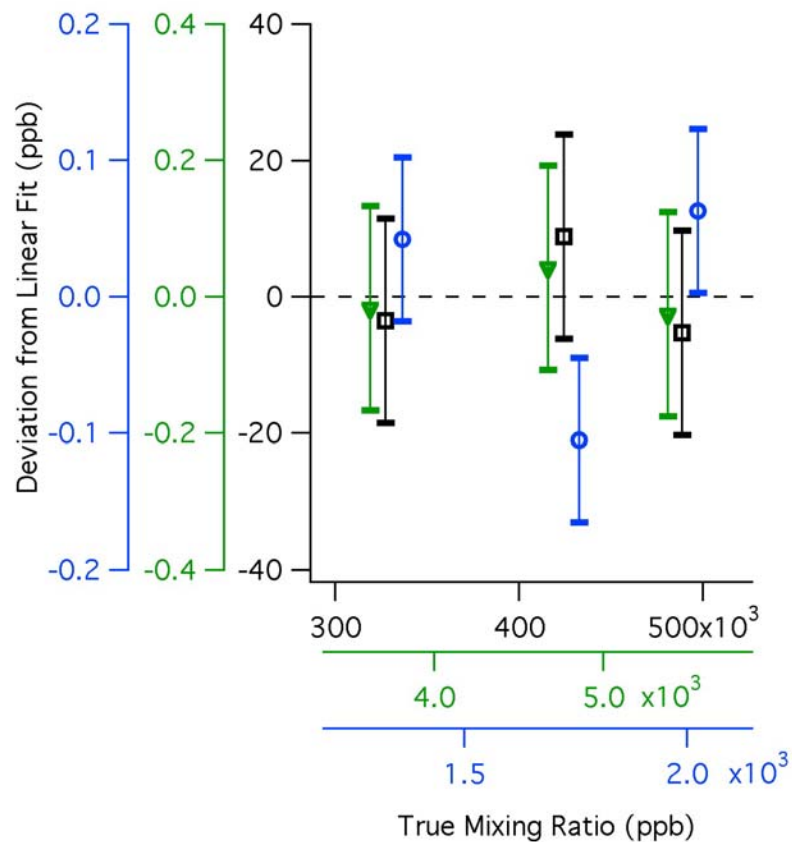
Calibration

MATERIALS: Stainless steel fittings, Synflex 1300 tubing, steel tanks → aluminum

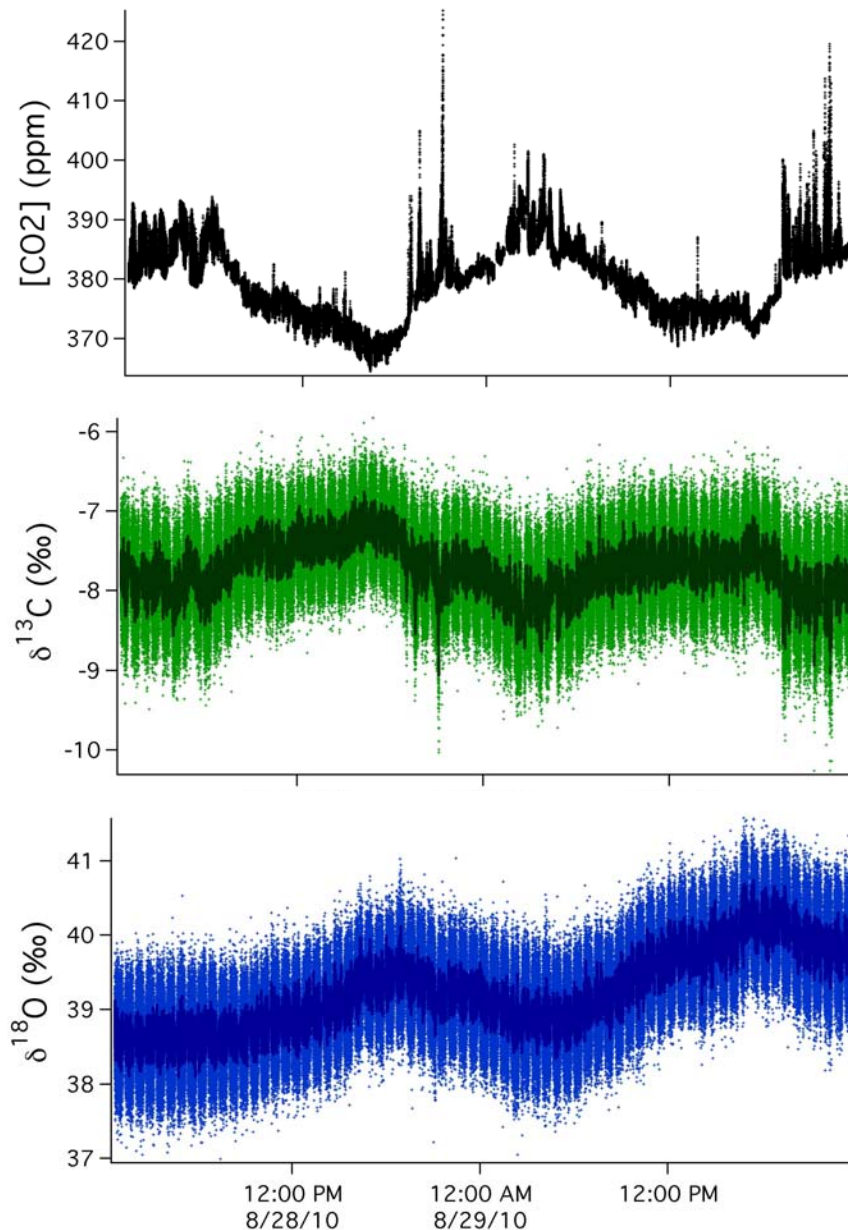
FREQUENCY: Every 40 minutes

TYPE: 2-point linear [by isotopologue](#) (3-point linear for propagating tanks)

STANDARDS: Ordinary tanks, $[\text{CO}_2]$ measured at Harvard, deltas by SIRFER (by flask)



Data Output



SAMPLING FREQ:

4Hz (true bandpass 0.7 Hz)

AVERAGING:

Effectively 30 min for EC

(we take advantage of both

high freq and averaging)

90 s for standards (Allan min at 60 s)

SAVING SPECTRA:

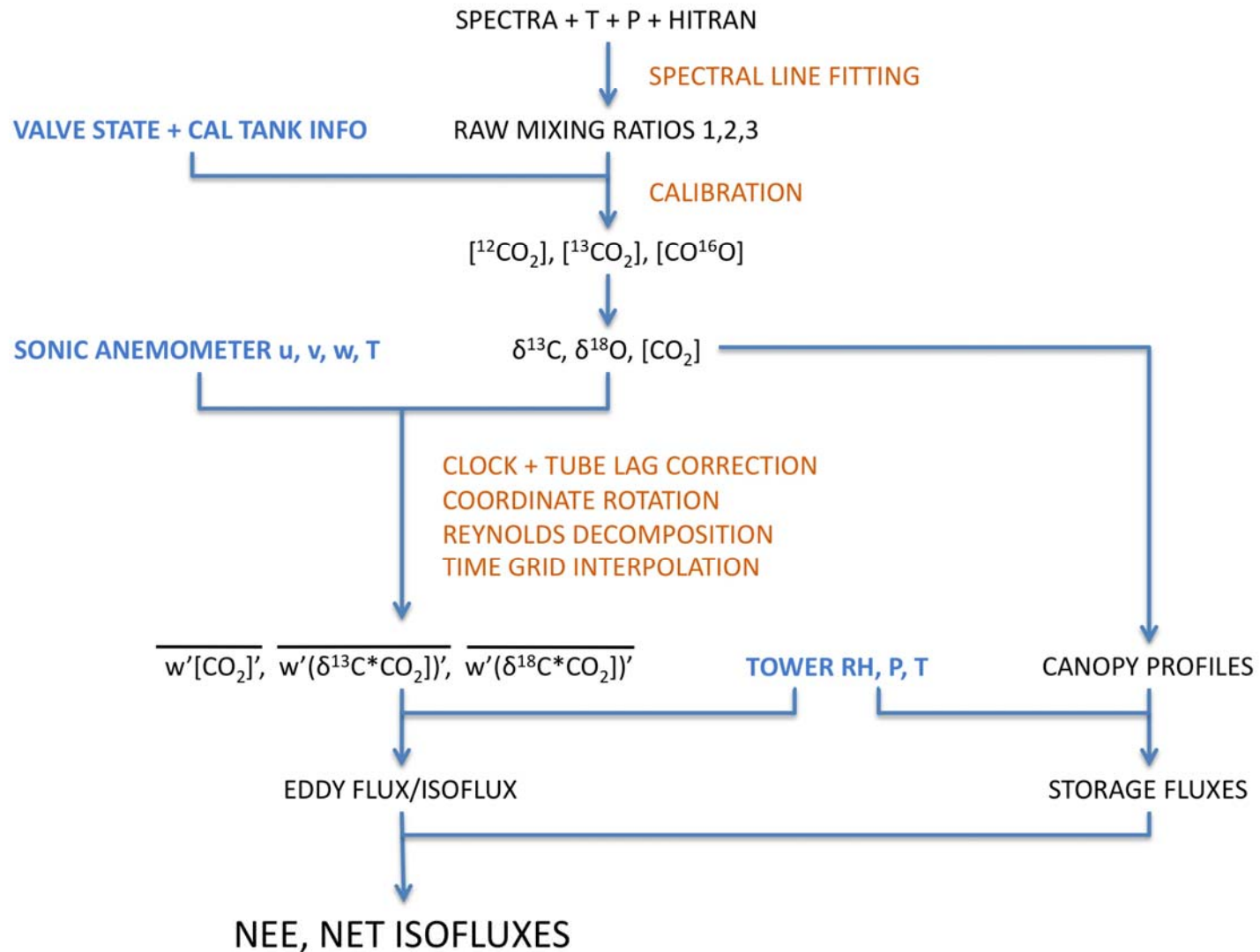
So far, only every 100th saved, for diagnostics, due to volume of data and slow transfer times

DATA TRANSFER:

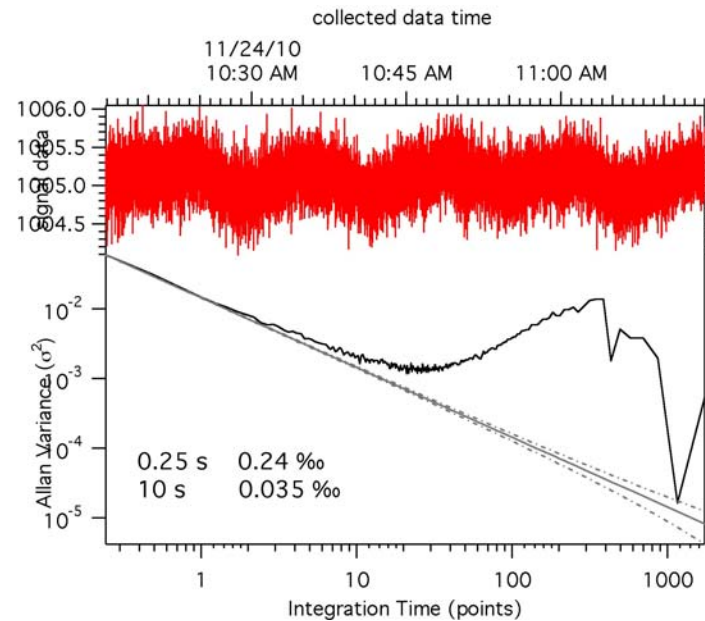
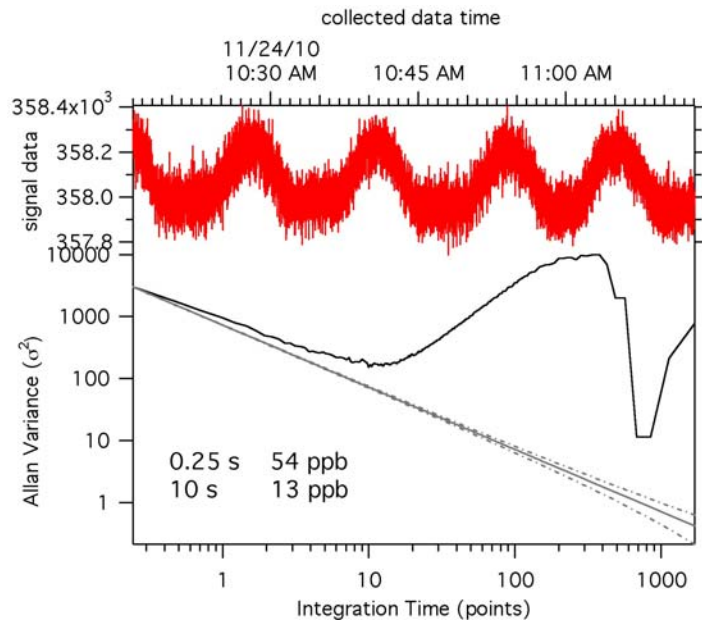
Mixing ratios, housekeeping by internet

Spectra will need portable drive

Data (Post-)Processing (in Igor)



Data Quality

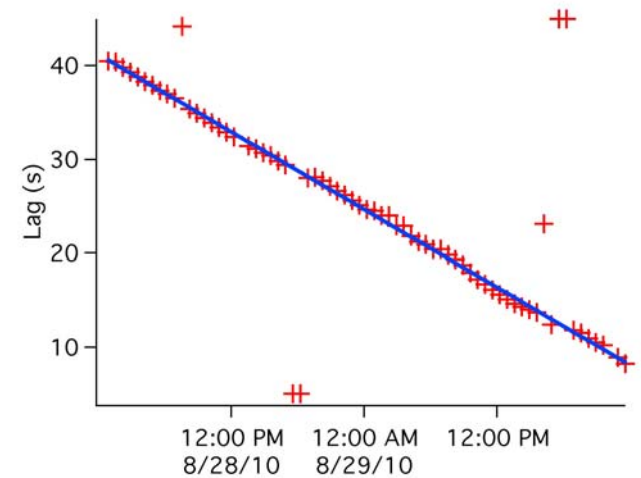


SPECTROSCOPIC PROBLEM: Dependence of mixing ratios on room temperature
(buried in signal variability except on tanks)

Data Quality

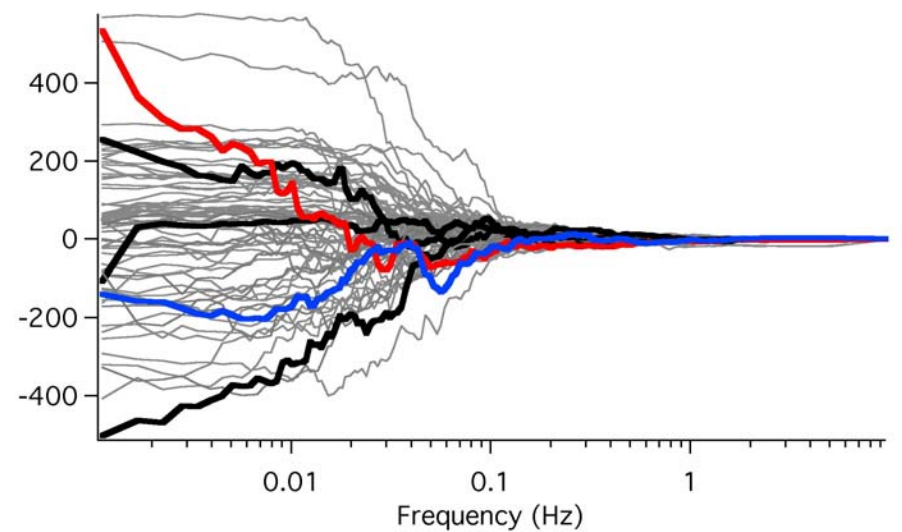
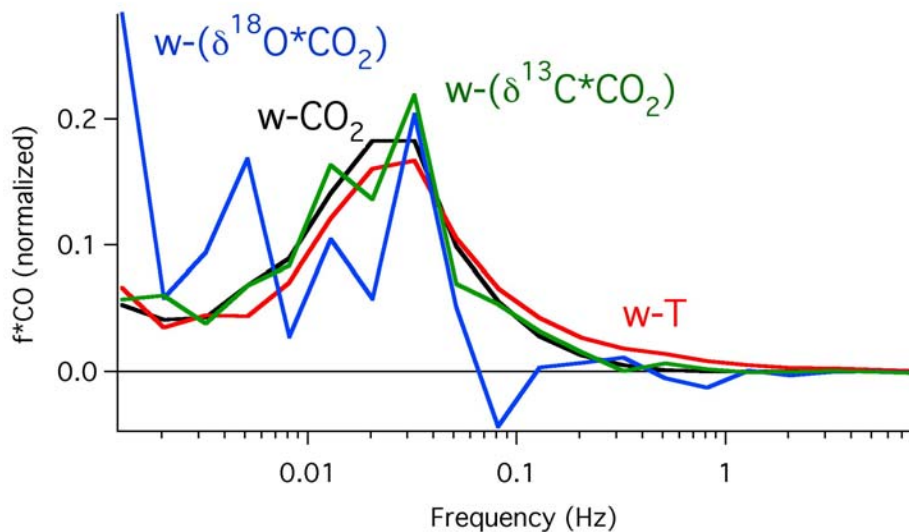
NON-SPECTROSCOPIC PROBLEMS:

1. Clock drift and jumps between sonic anemometer and spectrometer
2. (Initially) pressure spikes, regulator instability
3. Purge air (for the optics), shack a/c breakdowns
4. Sonic anemometer breakdowns, bad data
5. Gas tank supply delays

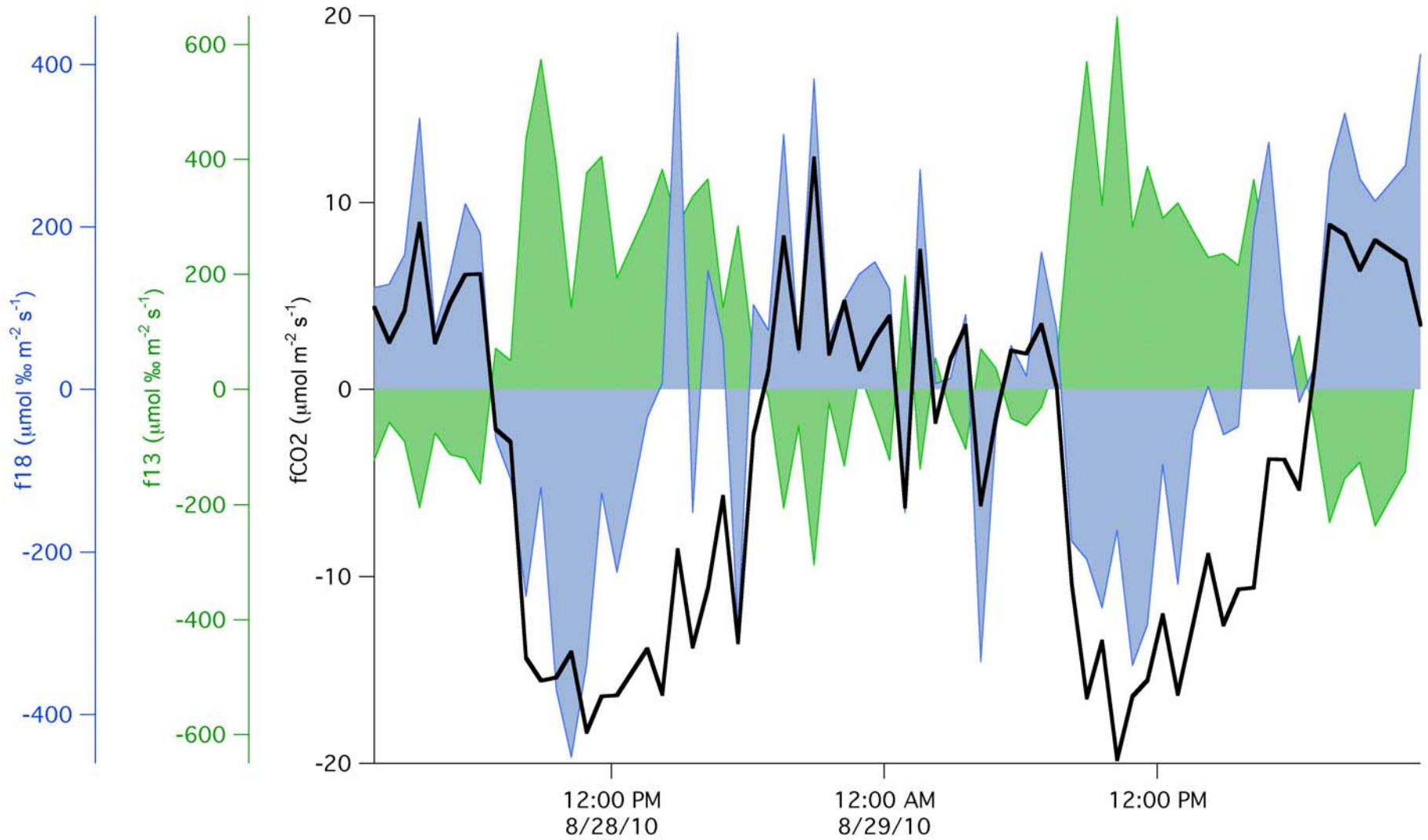


INTRIGUE:

Strange isotopic cospectra and ogives sometimes



But... Results!



But... Results!

