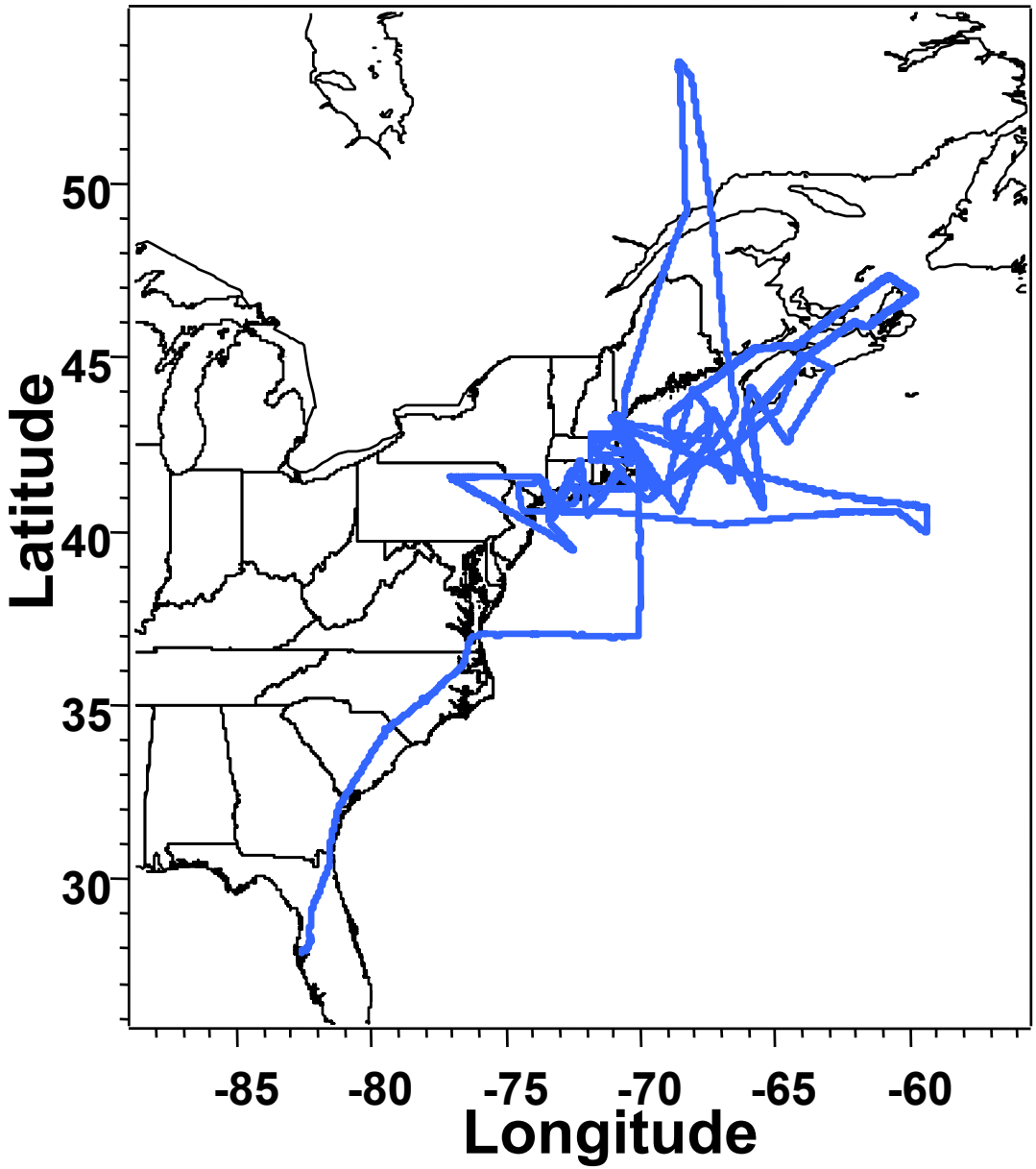
NOAA P3: What We've Seen, Where We're Going

Fehsenfeld, Brown, Brock, Cooper



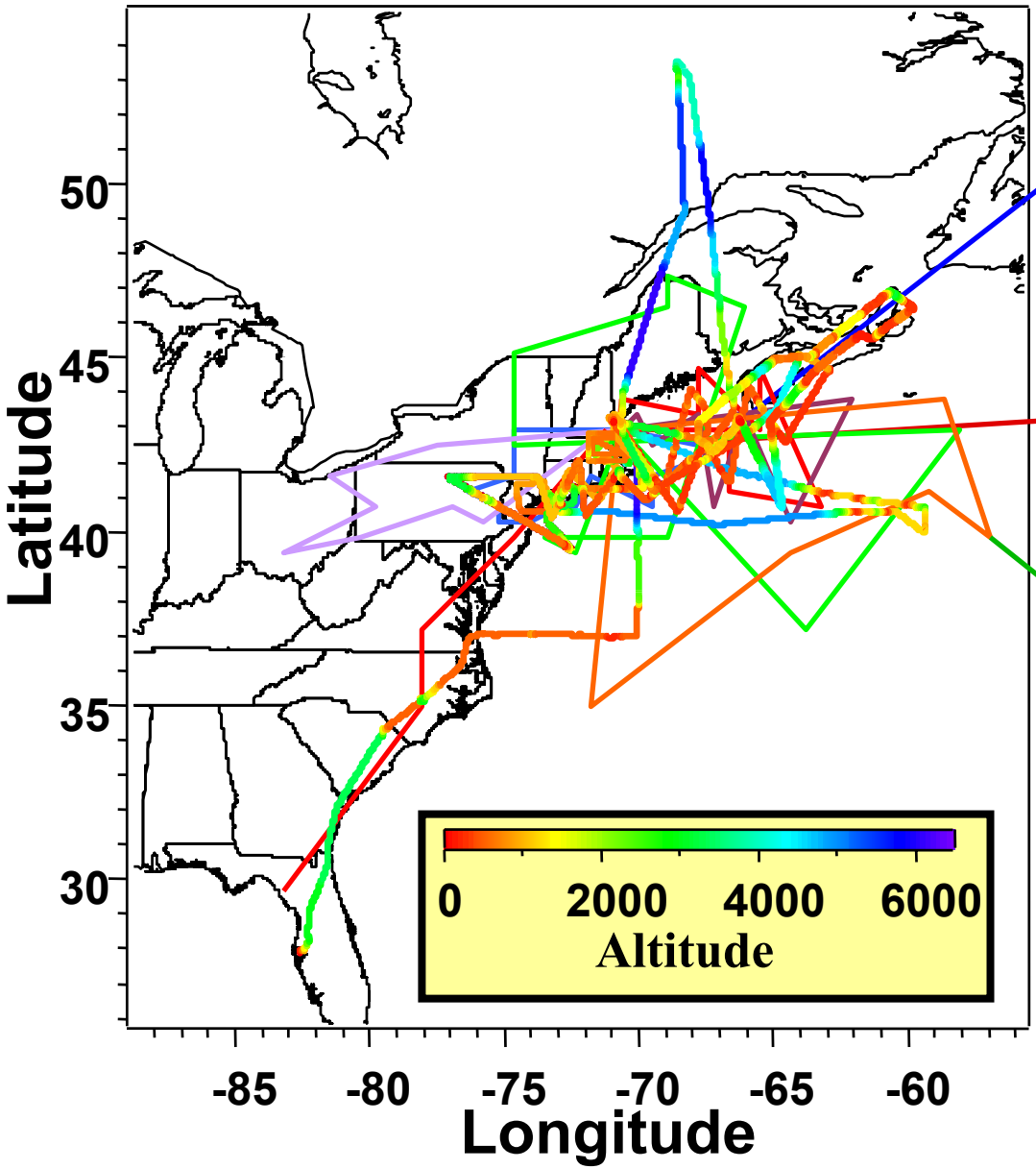
Six flights

Science Questions

- *Emissions verification*
- *Transport and mixing*
- *Chemical transformation*
- *Aerosol properties and radiative effects*
- *Forecast models*

Addressed many of these questions, but we will only talk about a few.

What We've Seen



The Future

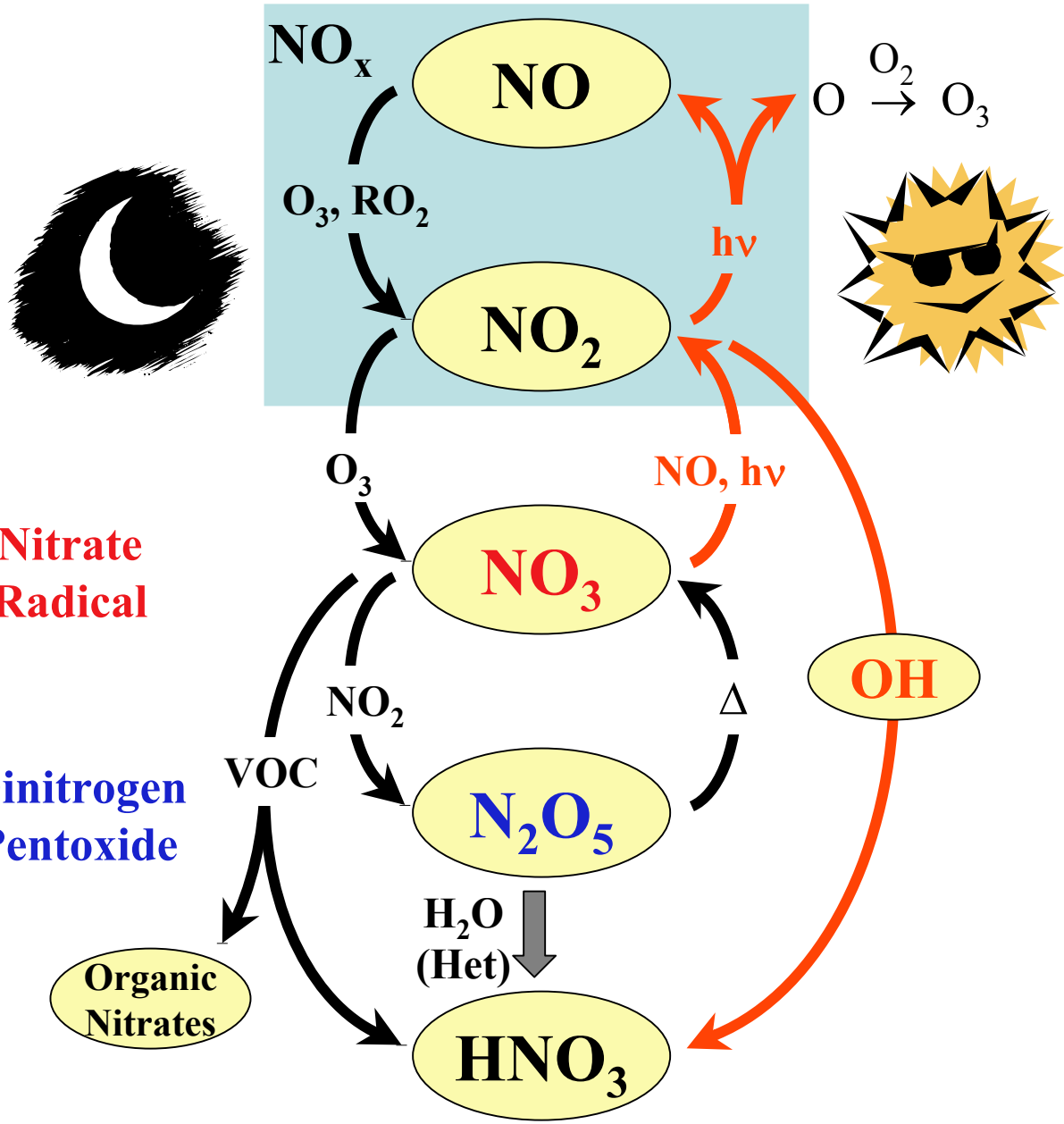
Steve Brown:
The Dark Side of the Force

Chuck Brock
Investigating Aerosols

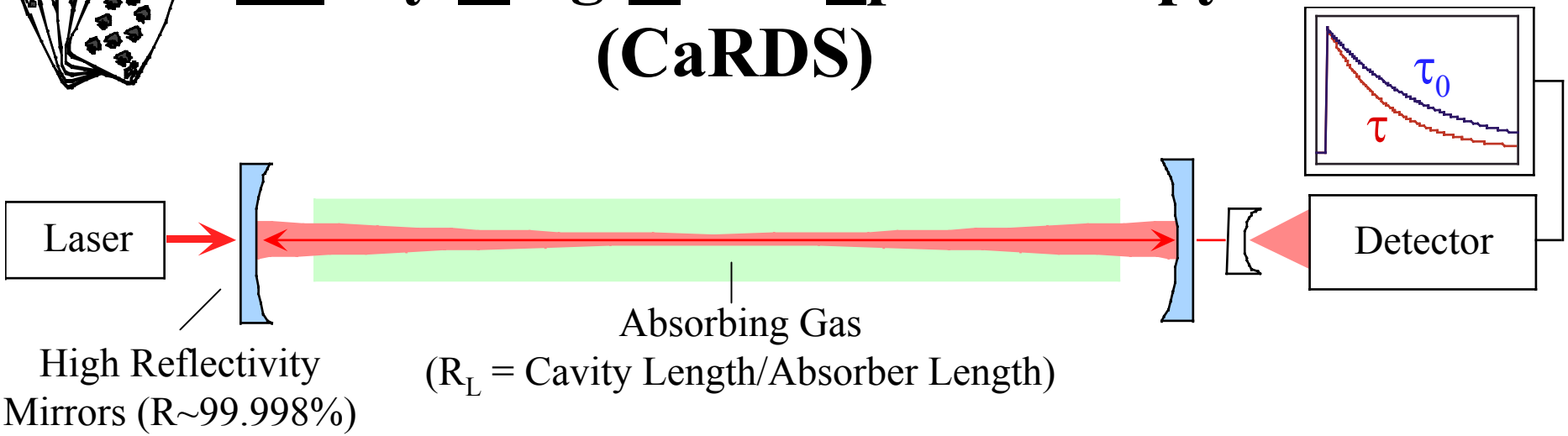
Qwen Cooper
A Look Ahead

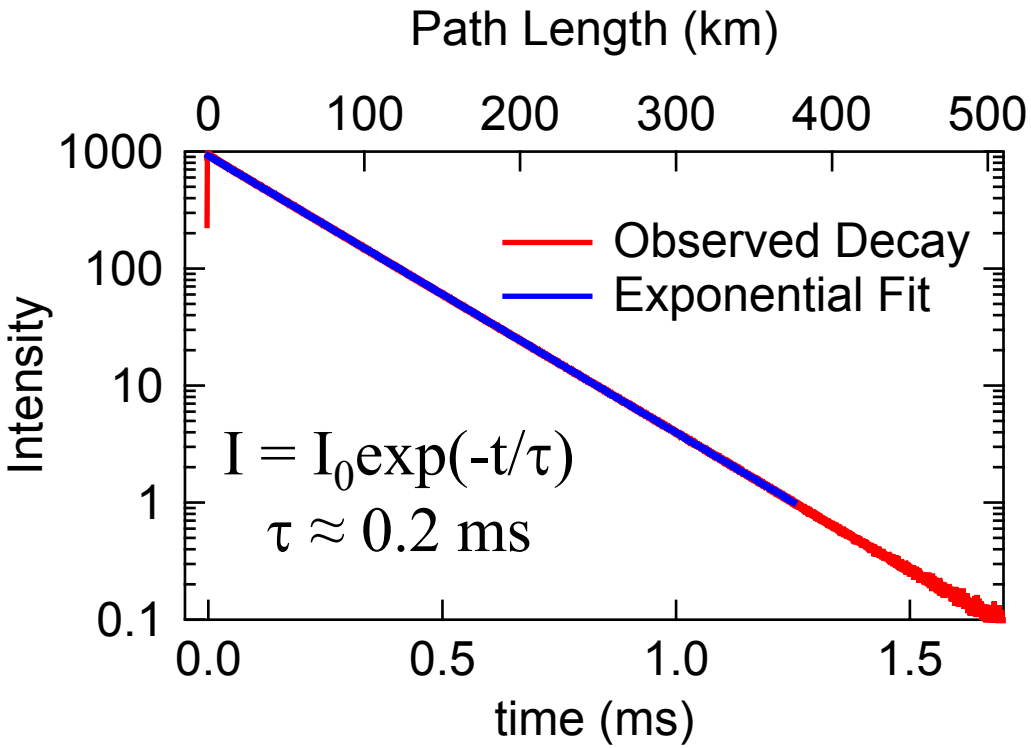
NEAQS/ICARTT 2004

Nocturnal Nitrogen Oxide Chemistry



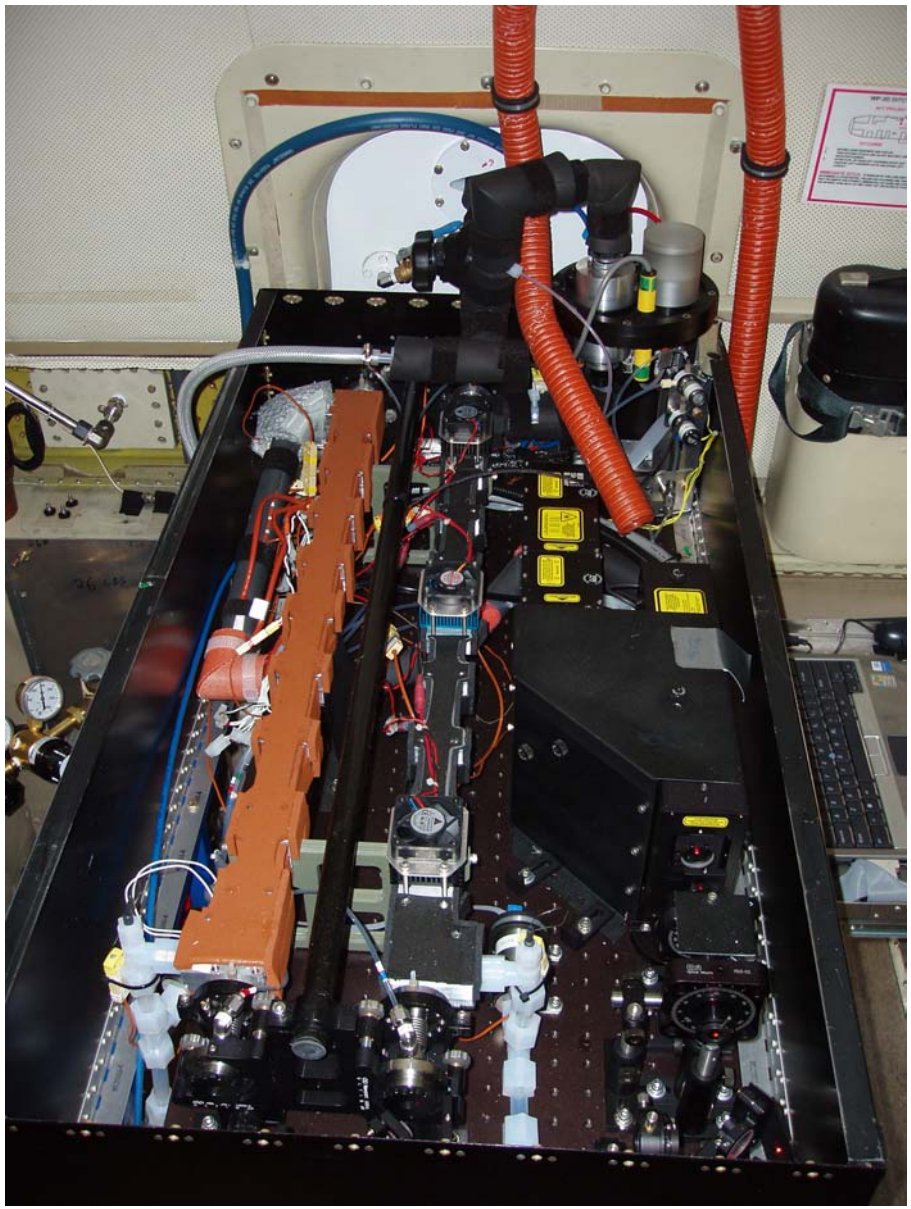
Cavity Ring-Down Spectroscopy (CaRDS)





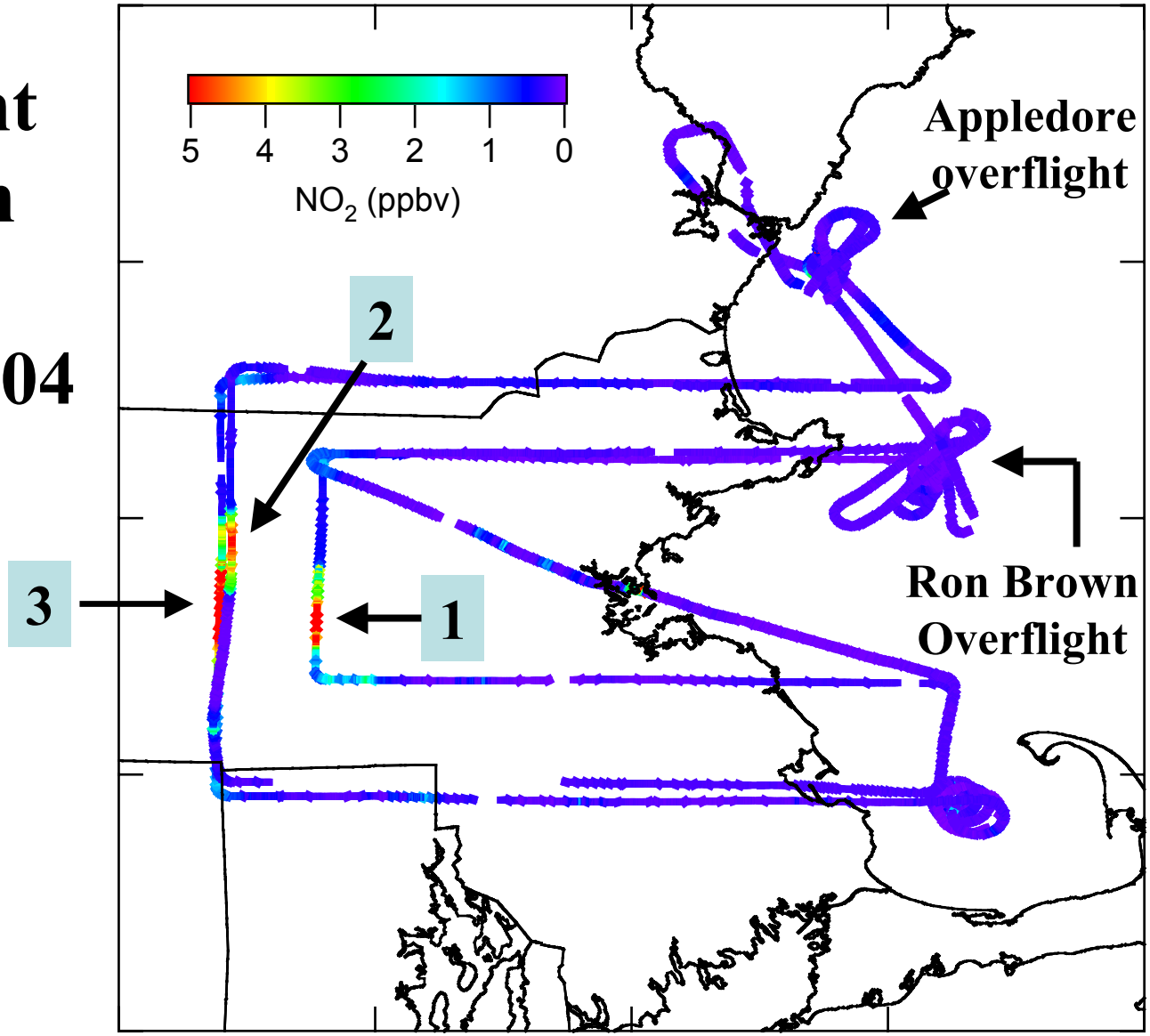
- Absolute concentration measurement
- Zero by addition of NO to inlet
  $NO + NO_3 \rightarrow 2NO_2$
- Detect N_2O_5 in heated inlet
  $N_2O_5 \rightarrow NO_2 + NO_3$
- Detection sensitivity for NO_3
  0.2 pptv in 1 s average

CaRDS instrument on NOAA P3

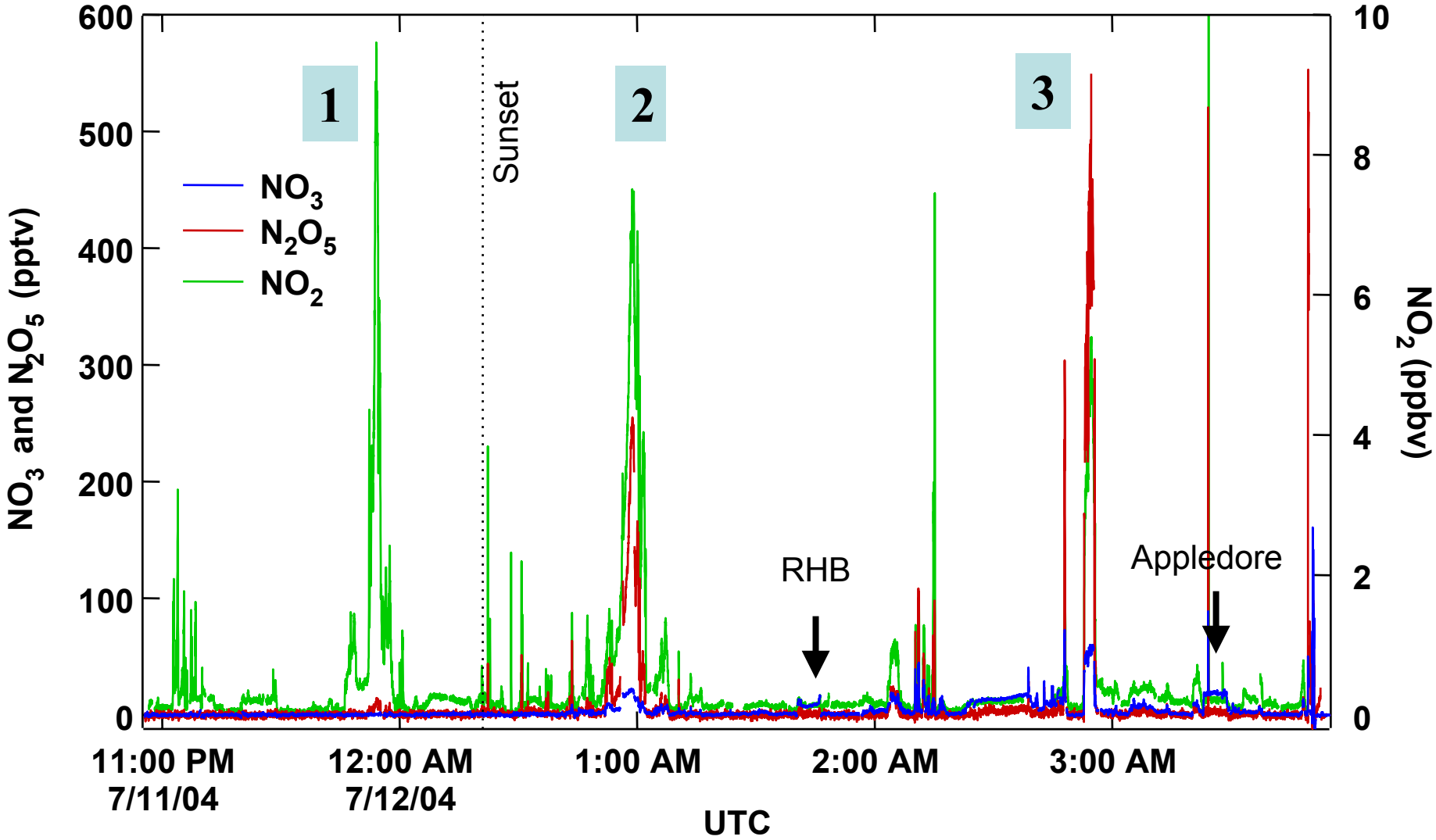


Sunset Flight over Boston

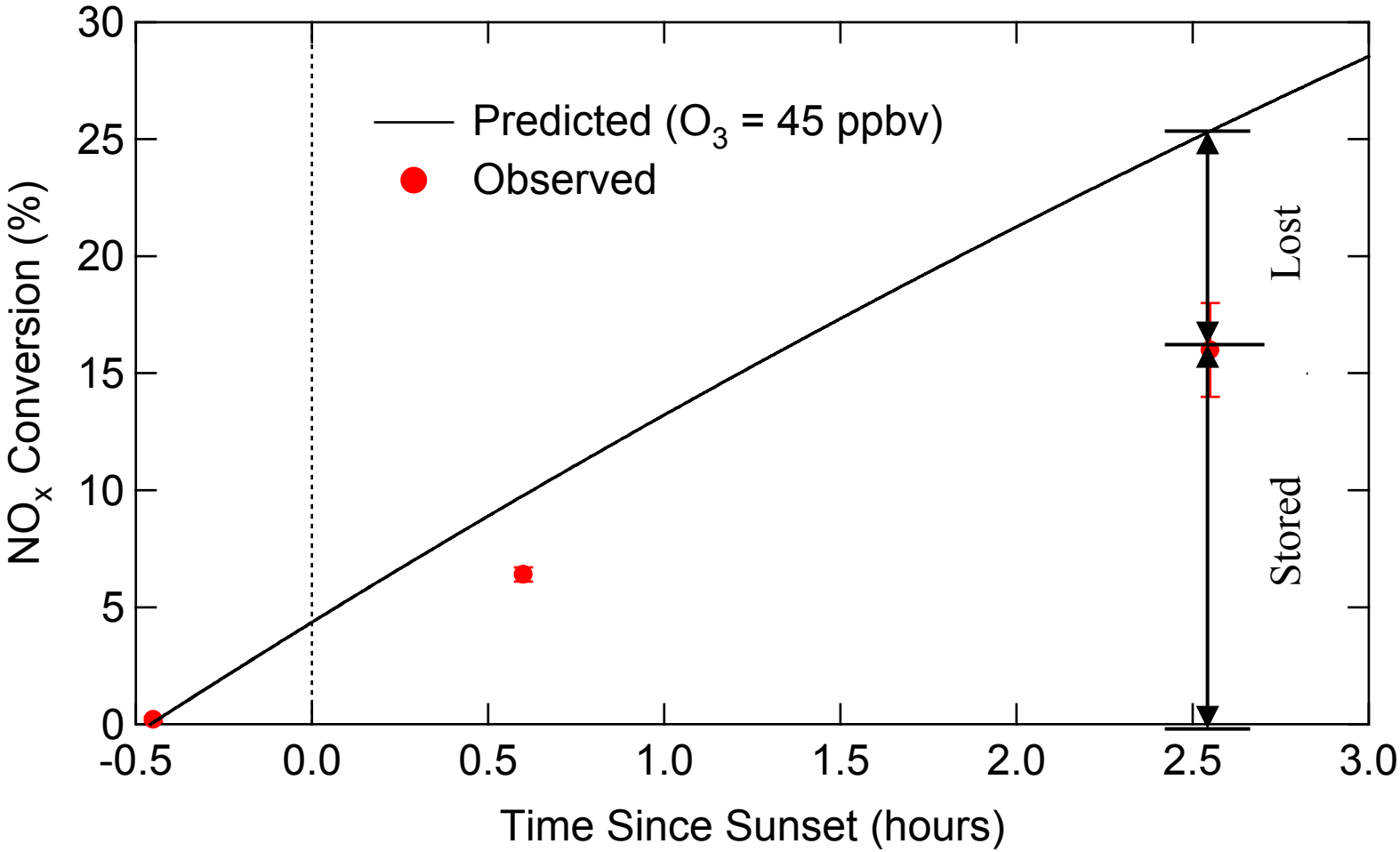
July 11-12 2004

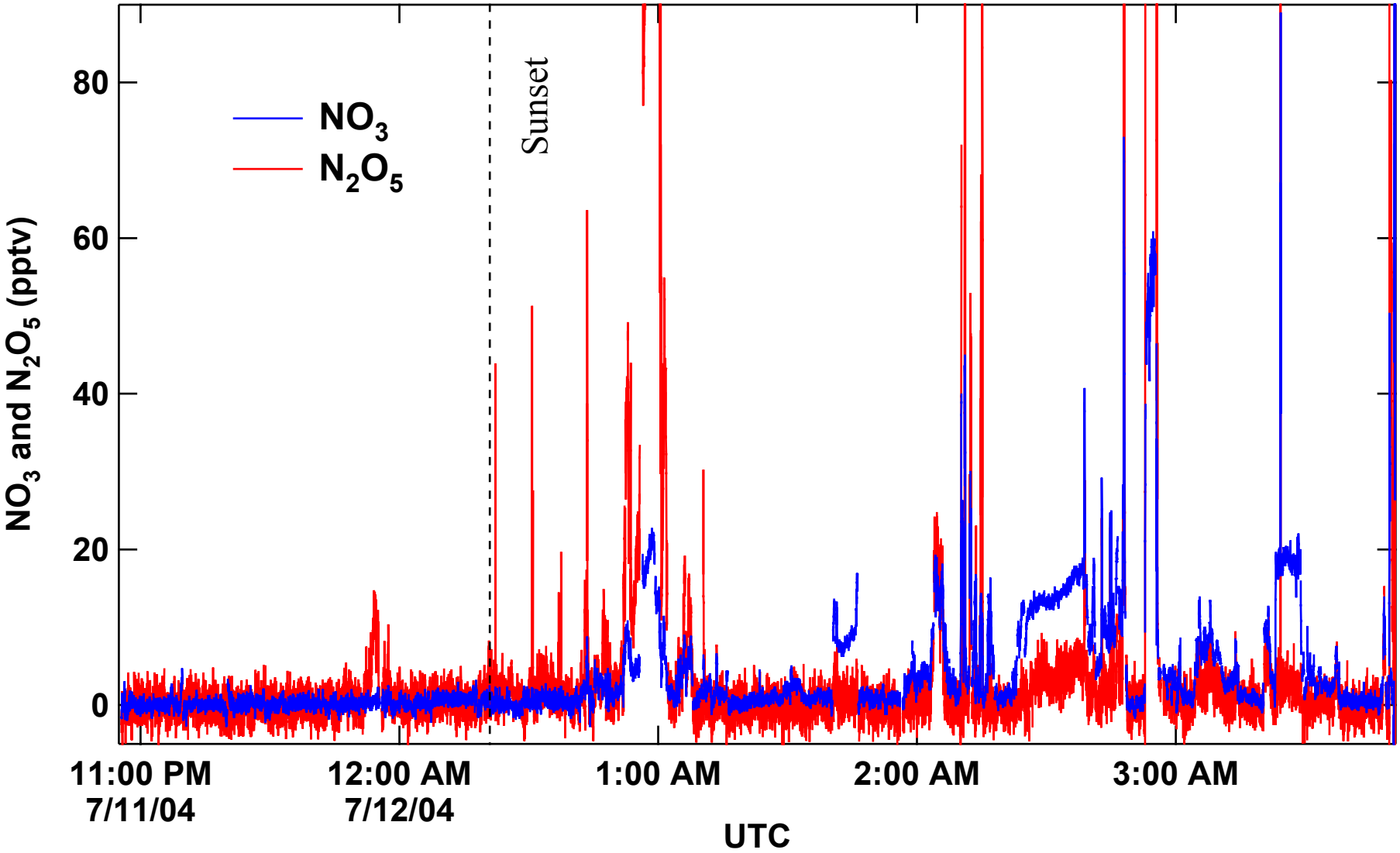


July 11 Sunset Flight - Nitrogen Oxides

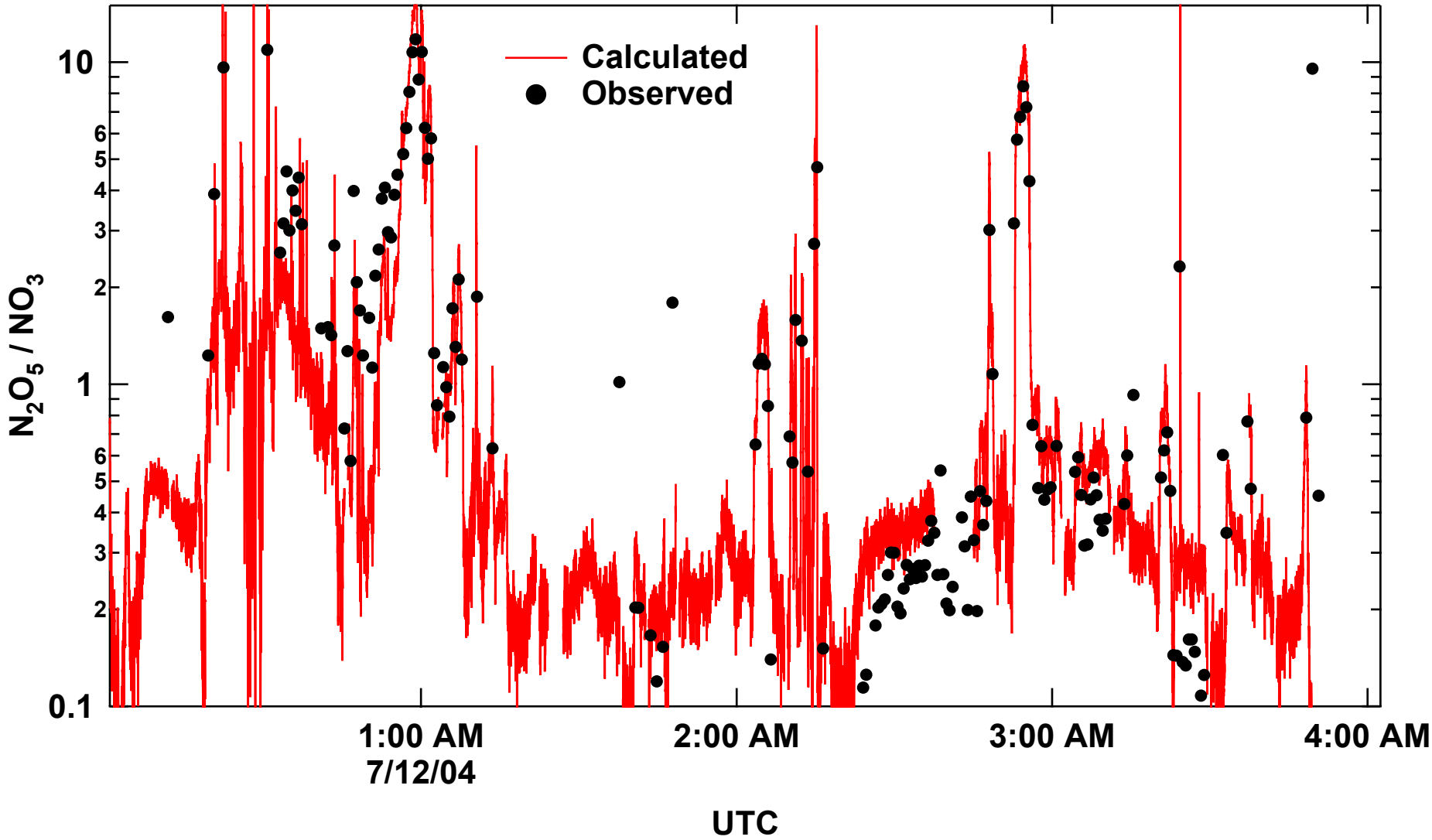


Conversion of NO_x to NO_3 & N_2O_5

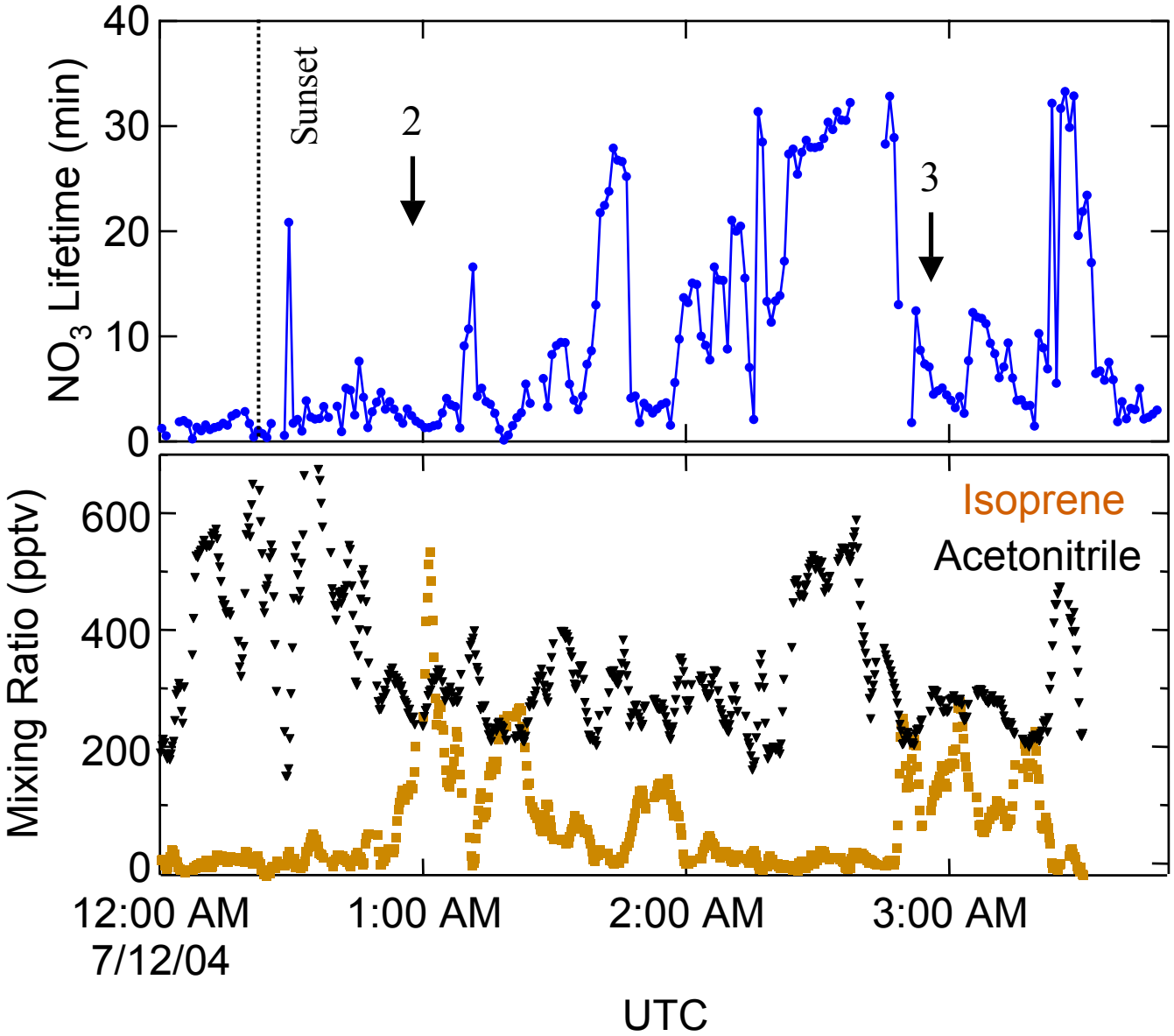



NO3
N2O5
Sunset
80
60
40
20
0
NO3 and N2O5 (pptv)
11:00 PM
7/11/04
12:00 AM
7/12/04
1:00 AM
2:00 AM
3:00 AM
UTC

N_2O_5 / NO_3 Ratio



NO_3 Lifetime

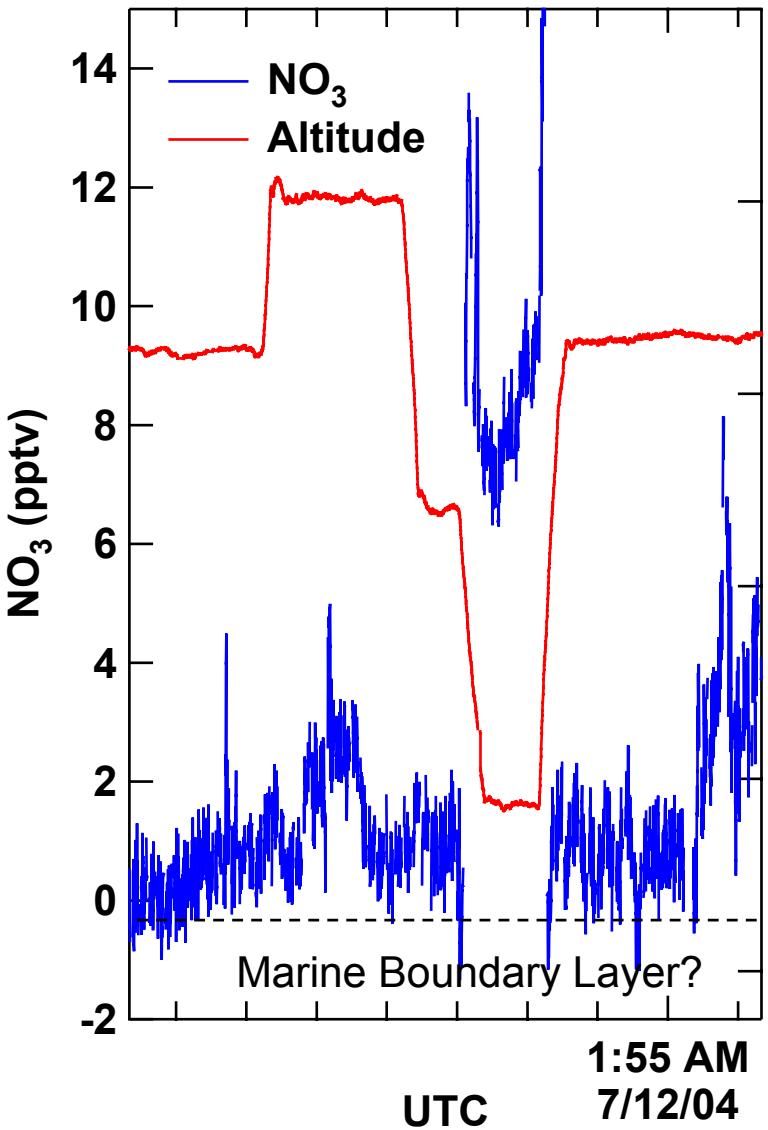


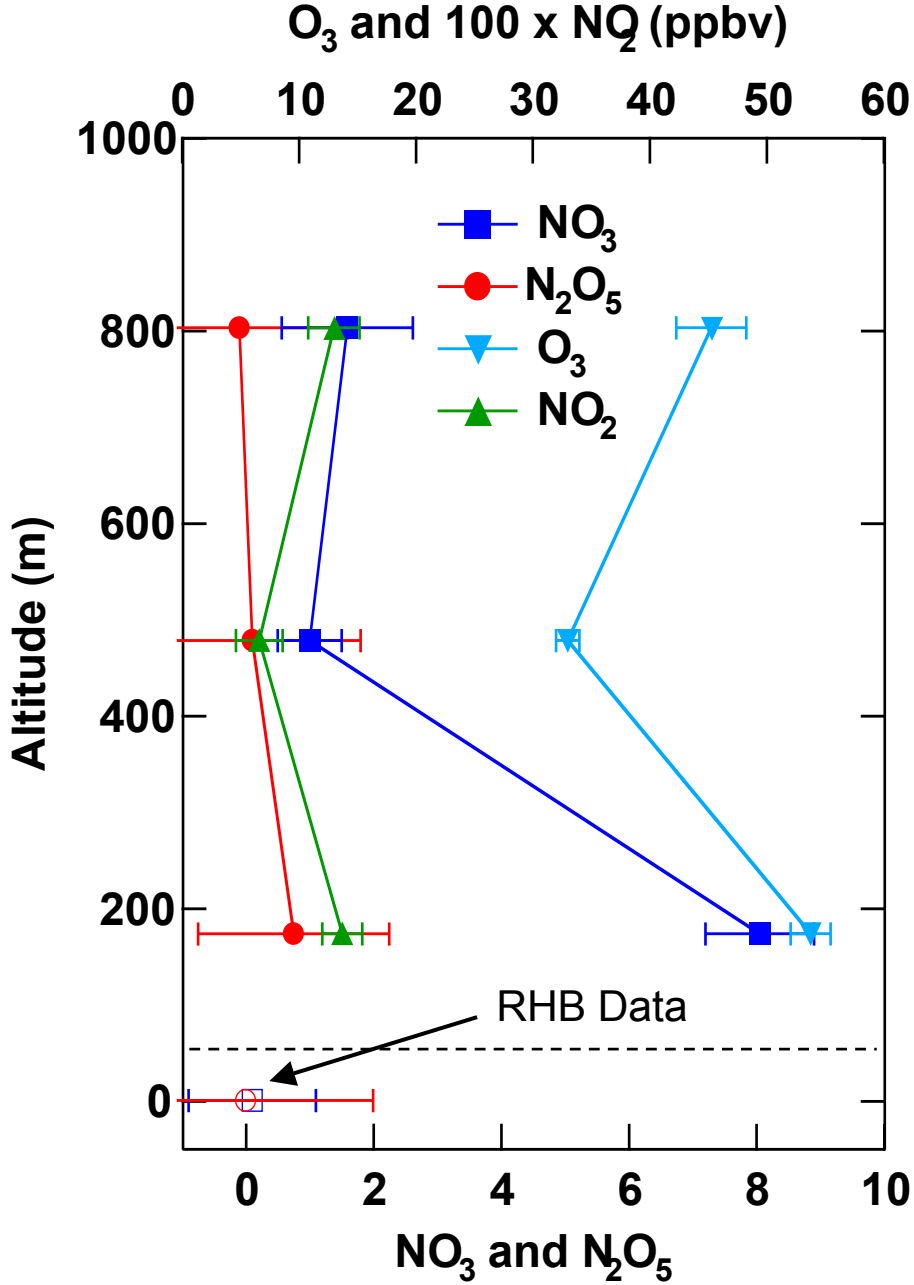
$$\tau(NO_3) \equiv \frac{NO_3}{k\, NO_2\, O_3}$$

Long NO_3 Lifetime
in aged biomass plume

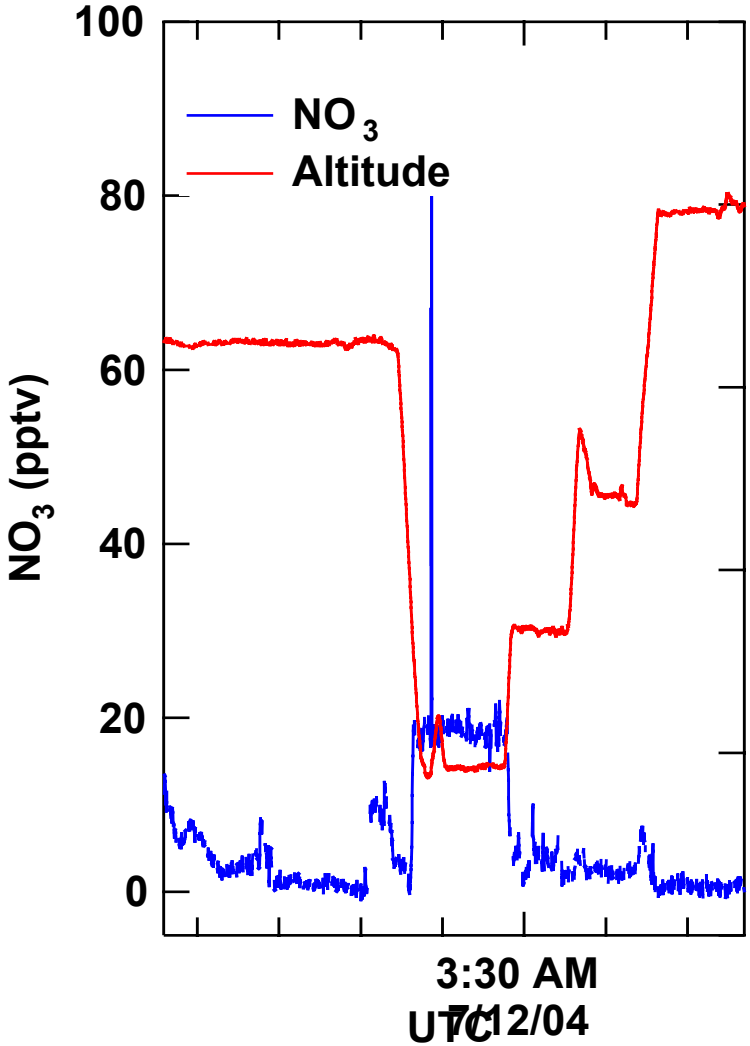
Aerosol content
> 90% organic

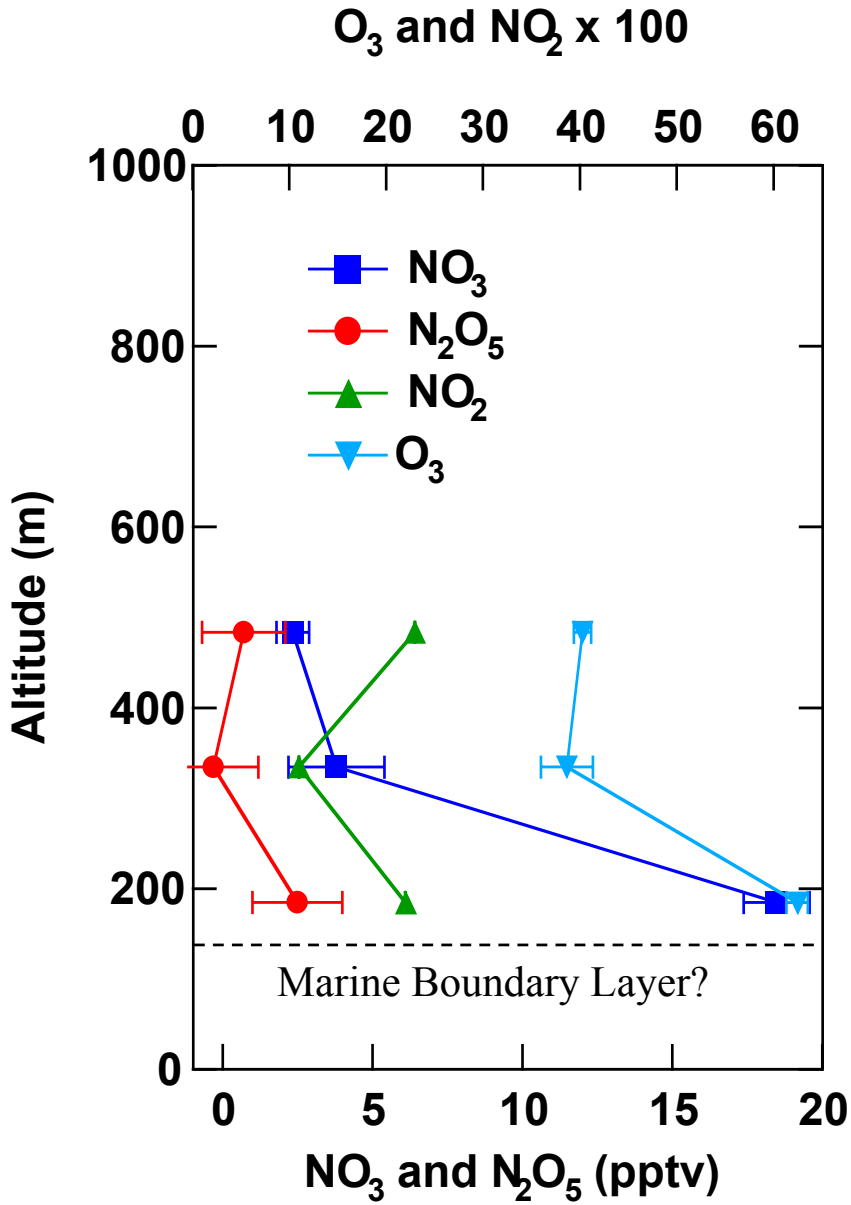
Vertical Profile Over NOAA R/V Ron Brown

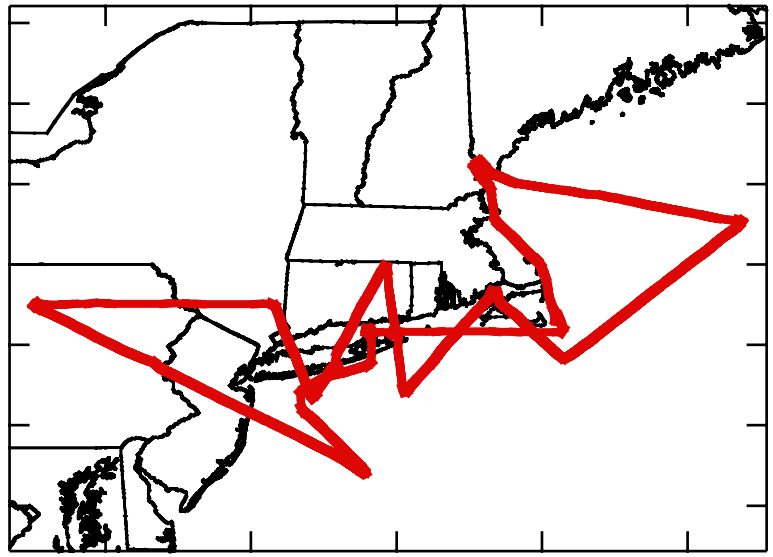
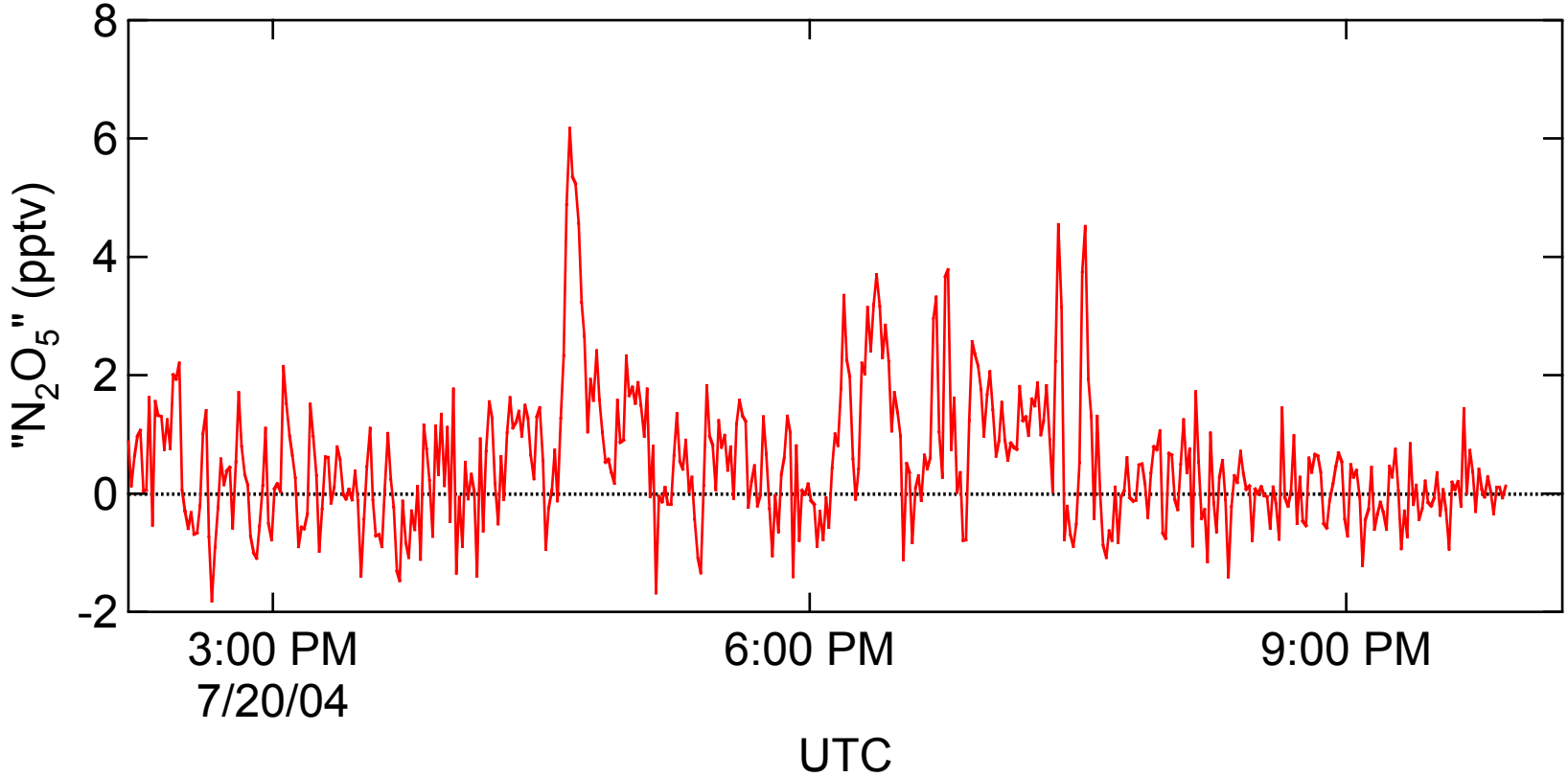




Vertical Profile Over Appledore Island





Daylight Flight over New York City

Daytime N_2O_5 ?