

# OWLETS-1 C-23 Sherpa Aircraft Data Analysis

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September 18, 2018

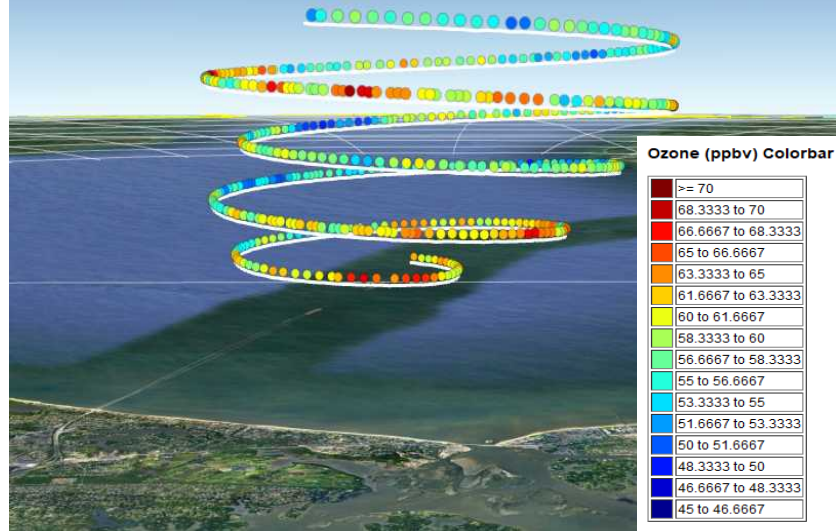
# Highlights

- Sherpa aircraft spirals conducted over the Chesapeake Bay Bridge Tunnel (CBBT) and Hampton Roads Region
  - July 19 and 20
  - Comparisons with Langley Mobile Ozone Lidar (LMOL) at CBBT
- July 20, 2017 Case Study
  - Spiral plots, CO/CO<sub>2</sub> Ratios
  - Google Earth spiral tracks and paths
- Preliminary results: how will TEMPO potentially observe ozone and other constituents?
- Analysis with ship data

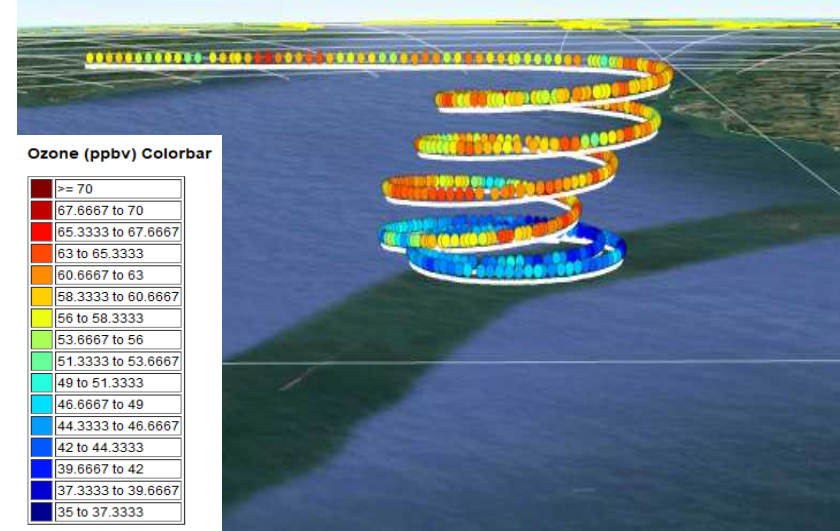
# Completed for Each Spiral

- KMZ files for Ozone, NO, NO<sub>2</sub>, CO, CO<sub>2</sub>, and CH<sub>2</sub>O over all spiral locations and entire flight
- Multiple species plots created for each spiral
  - (Lat/Lon-Species, Altitude vs. Species)

July 19, 2017 CBBT Spiral (18:28-18:44 UTC)  
- Ozone

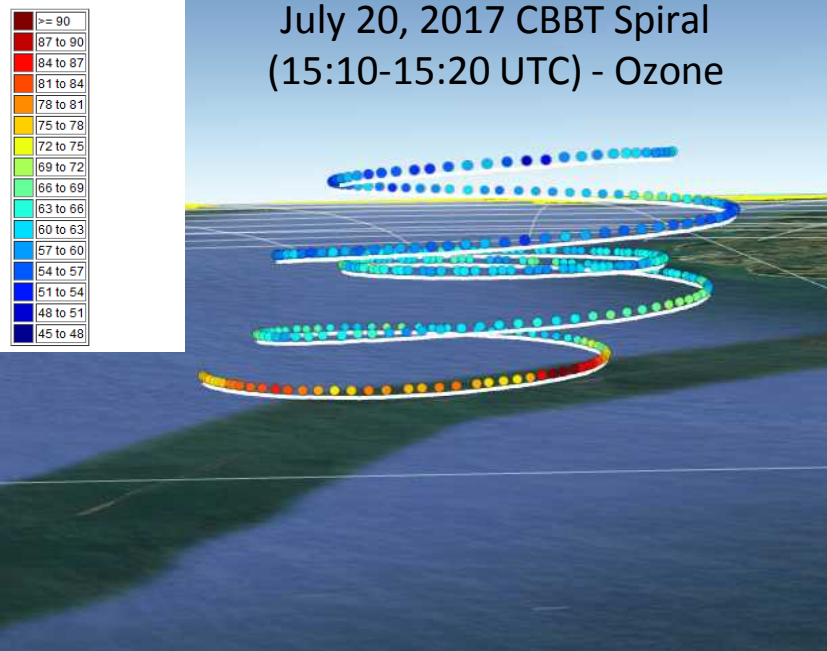


July 19, 2017 CBBT Spiral (20:28-20:43 UTC)  
- Ozone

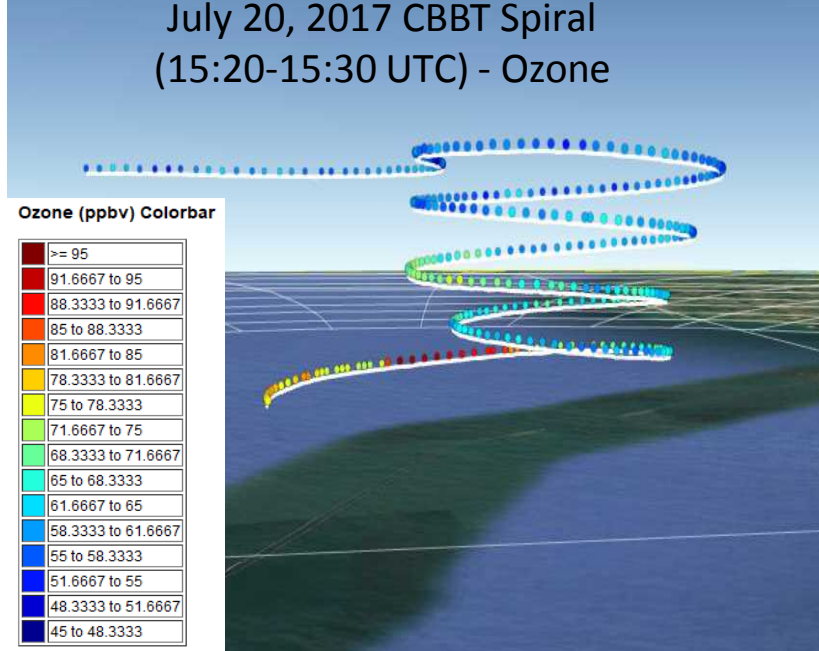


Ozone (ppbv) Colorbar

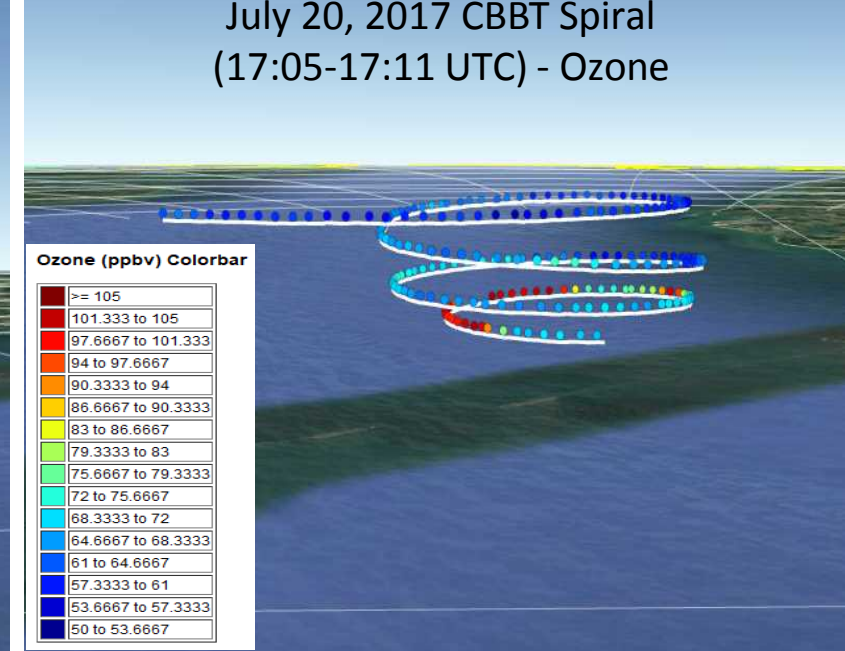
July 20, 2017 CBBT Spiral  
(15:10-15:20 UTC) - Ozone



July 20, 2017 CBBT Spiral  
(15:20-15:30 UTC) - Ozone

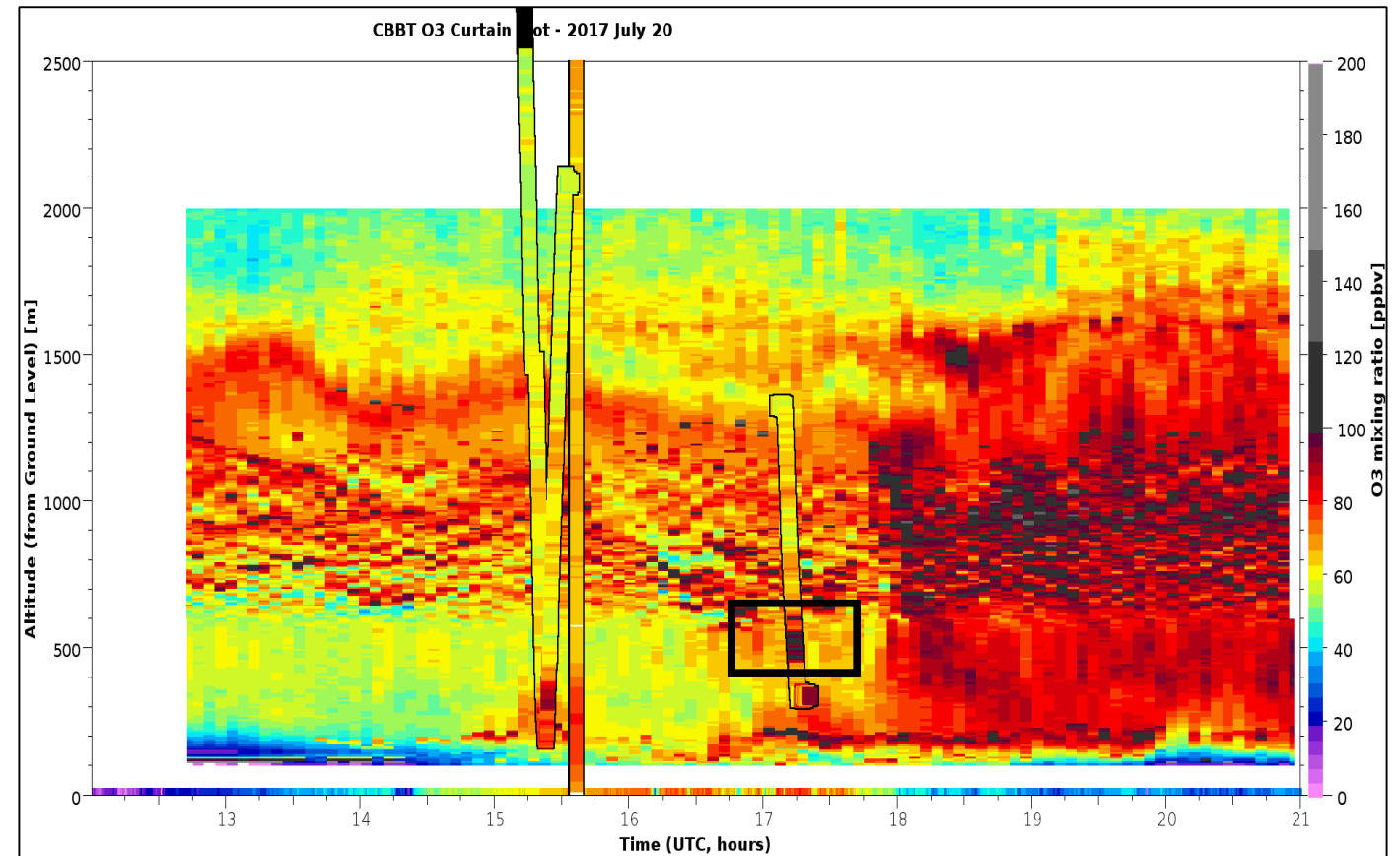
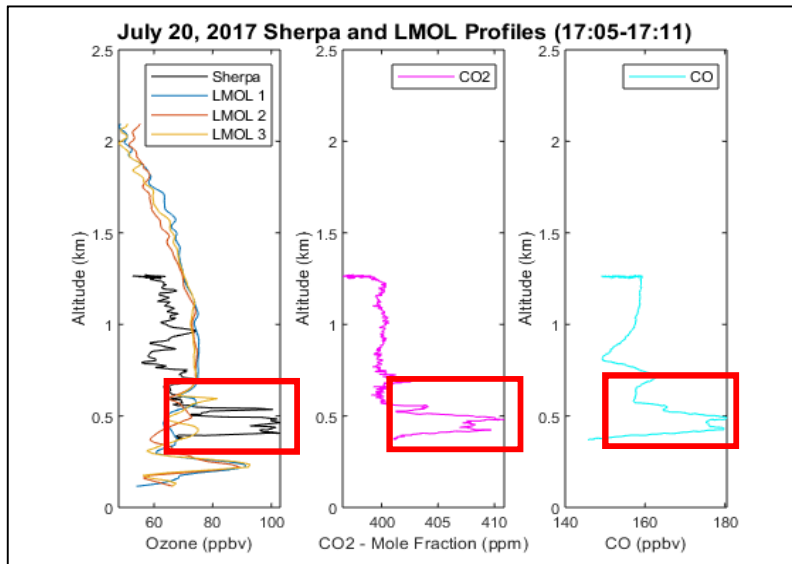
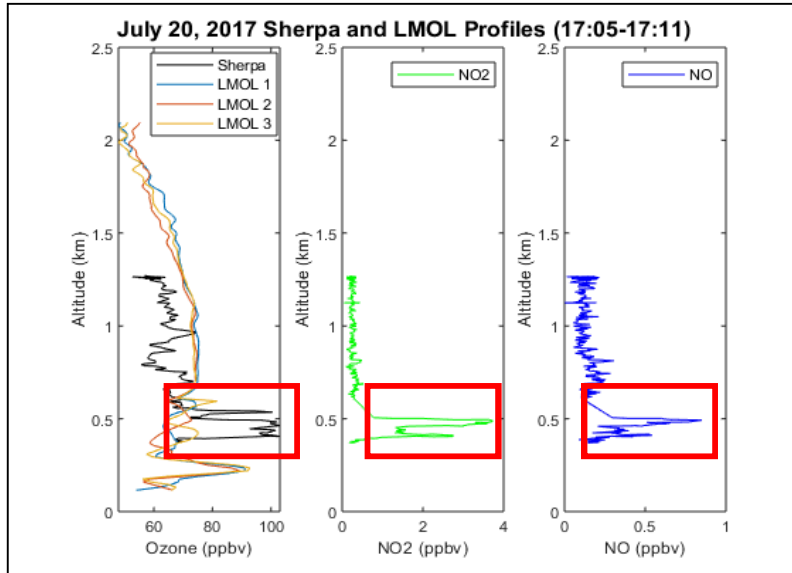


July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - Ozone

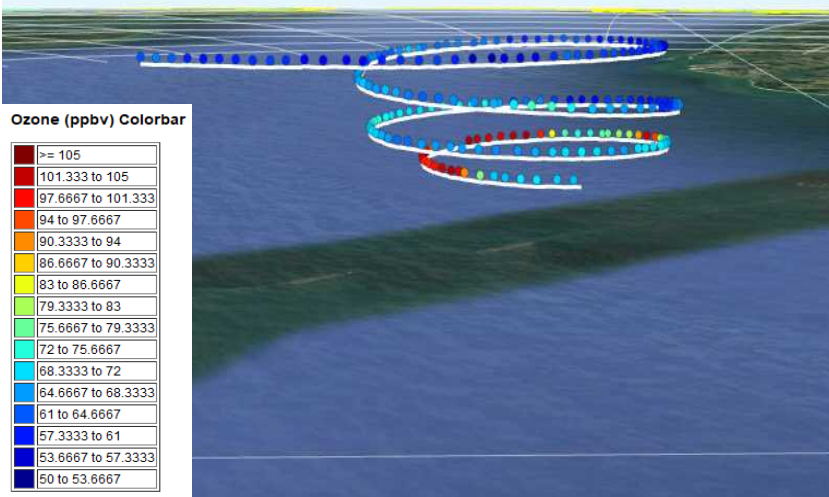


# July 20, 2017 – Case Study

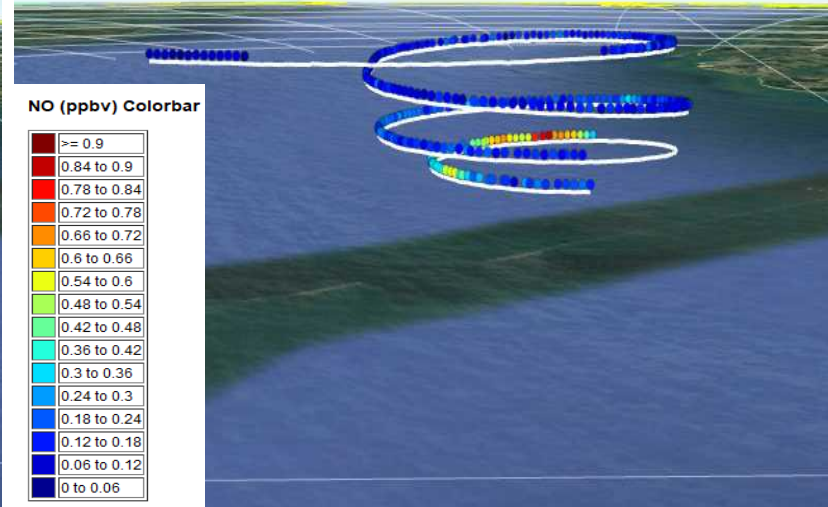
- Elevated layer of Ozone, NO, NO<sub>2</sub>, CO, and CO<sub>2</sub>



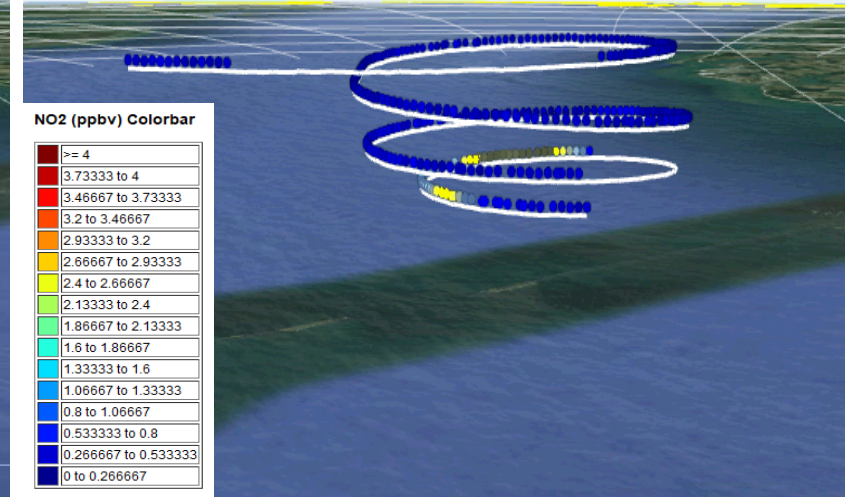
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - Ozone



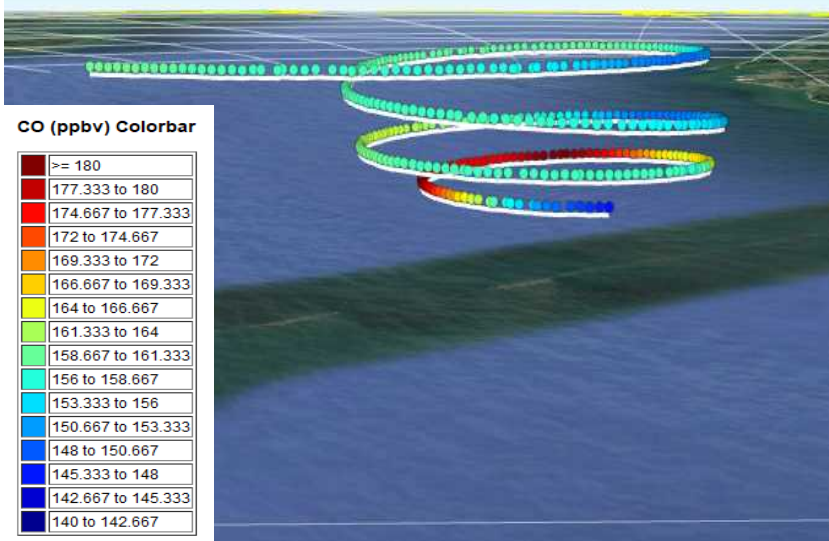
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - NO



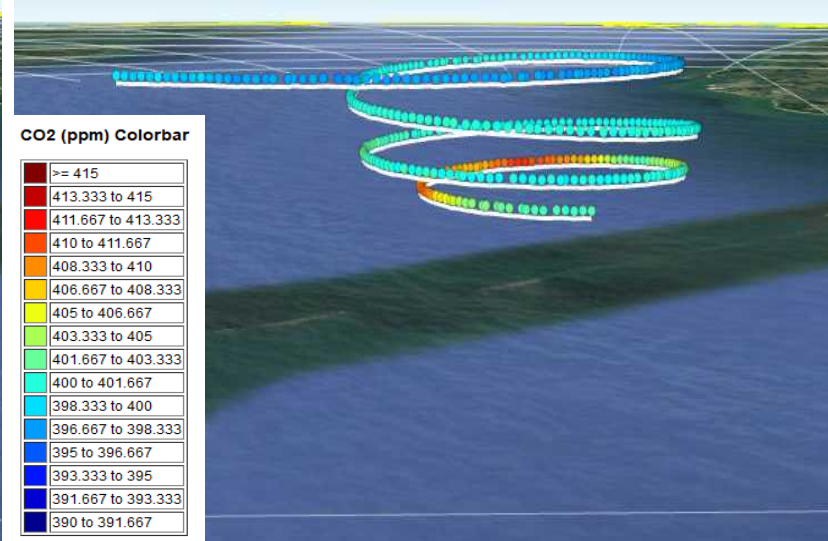
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - NO<sub>2</sub>



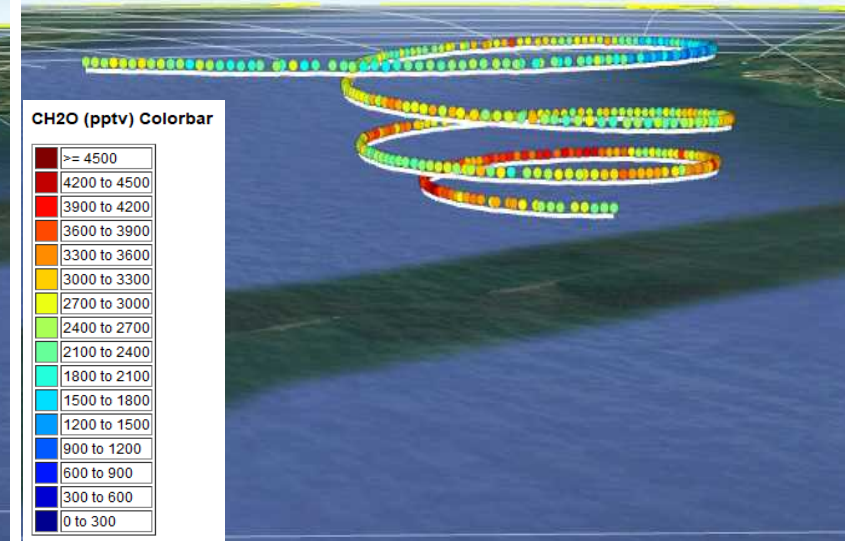
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - CO



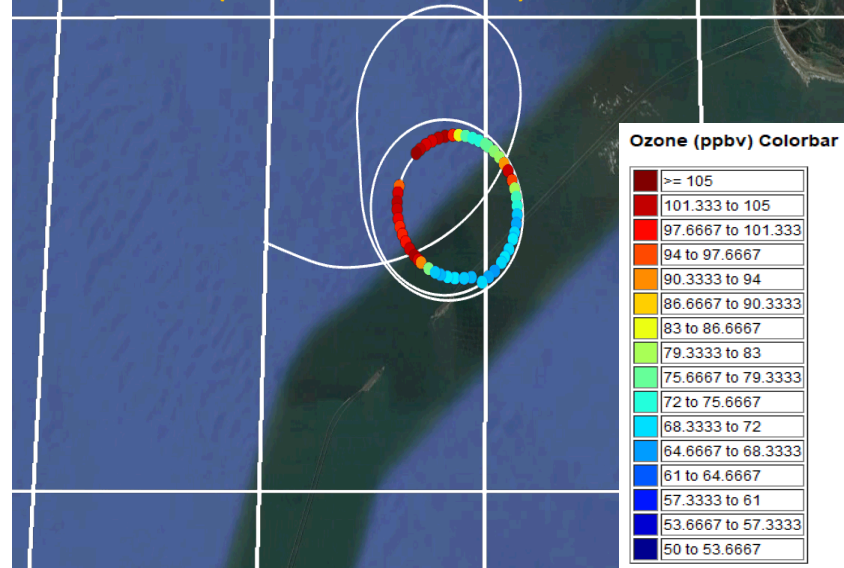
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - CO<sub>2</sub>



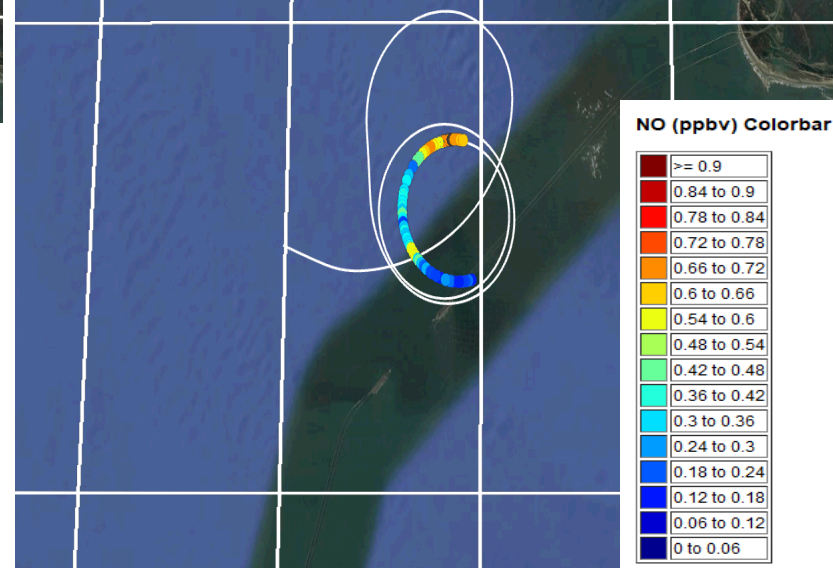
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - CH<sub>2</sub>O



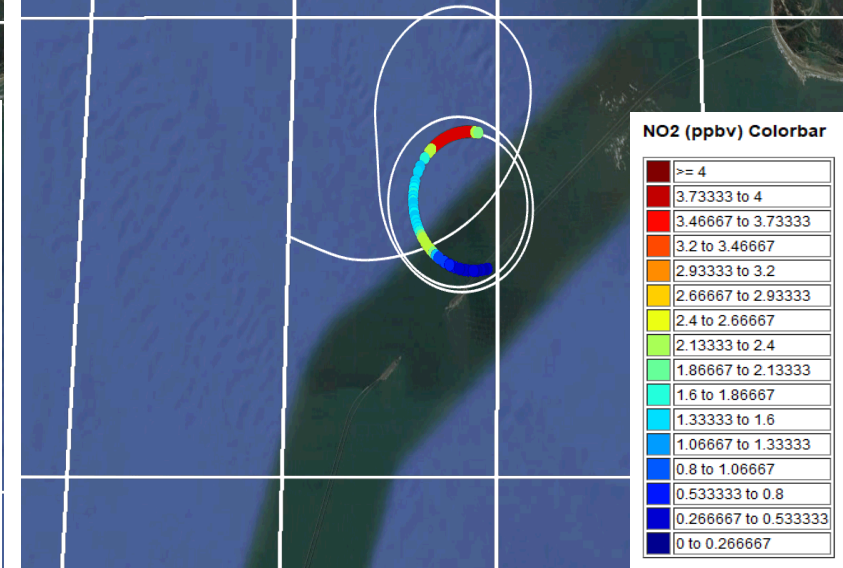
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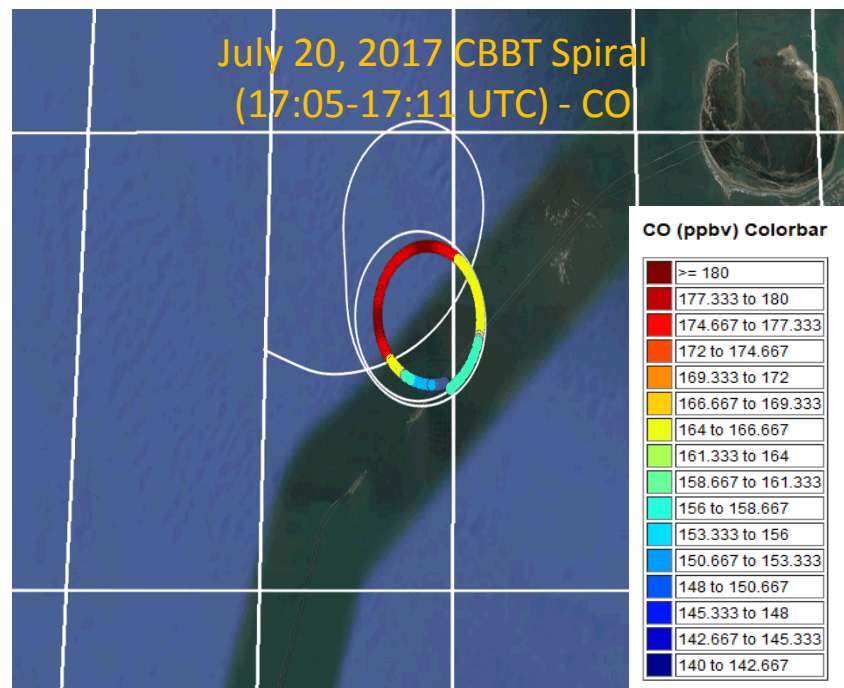
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - NO



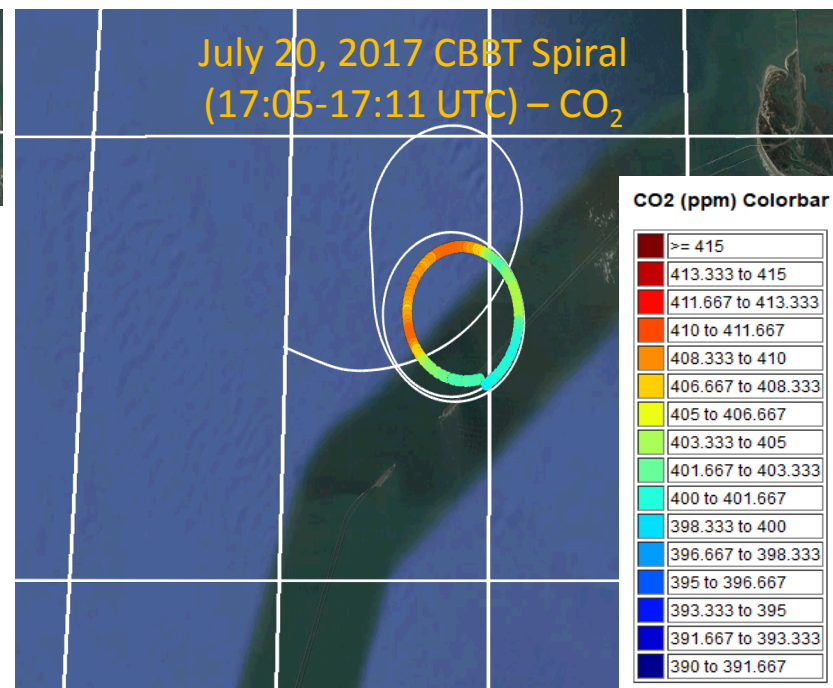
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - NO<sub>2</sub>



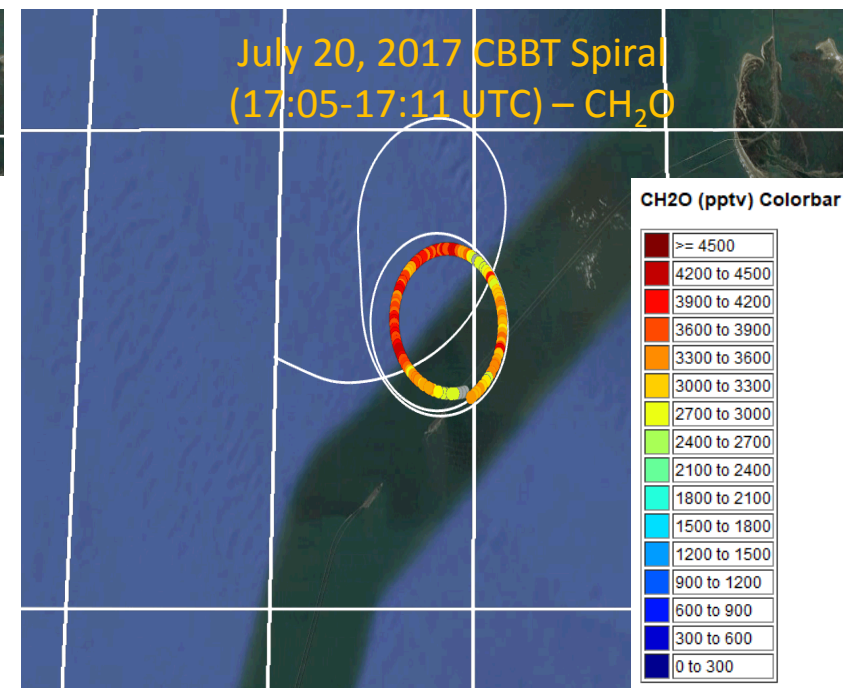
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - CO



July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - CO<sub>2</sub>



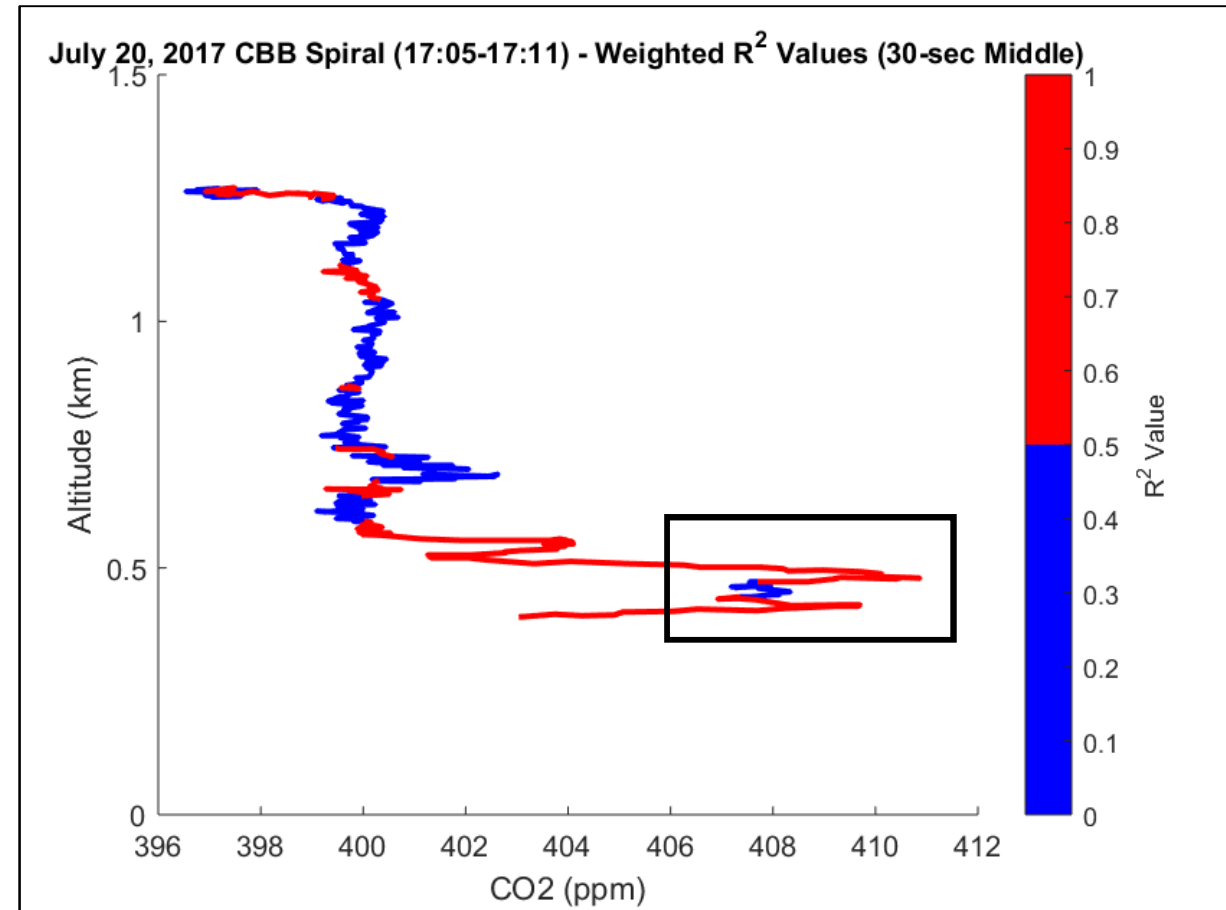
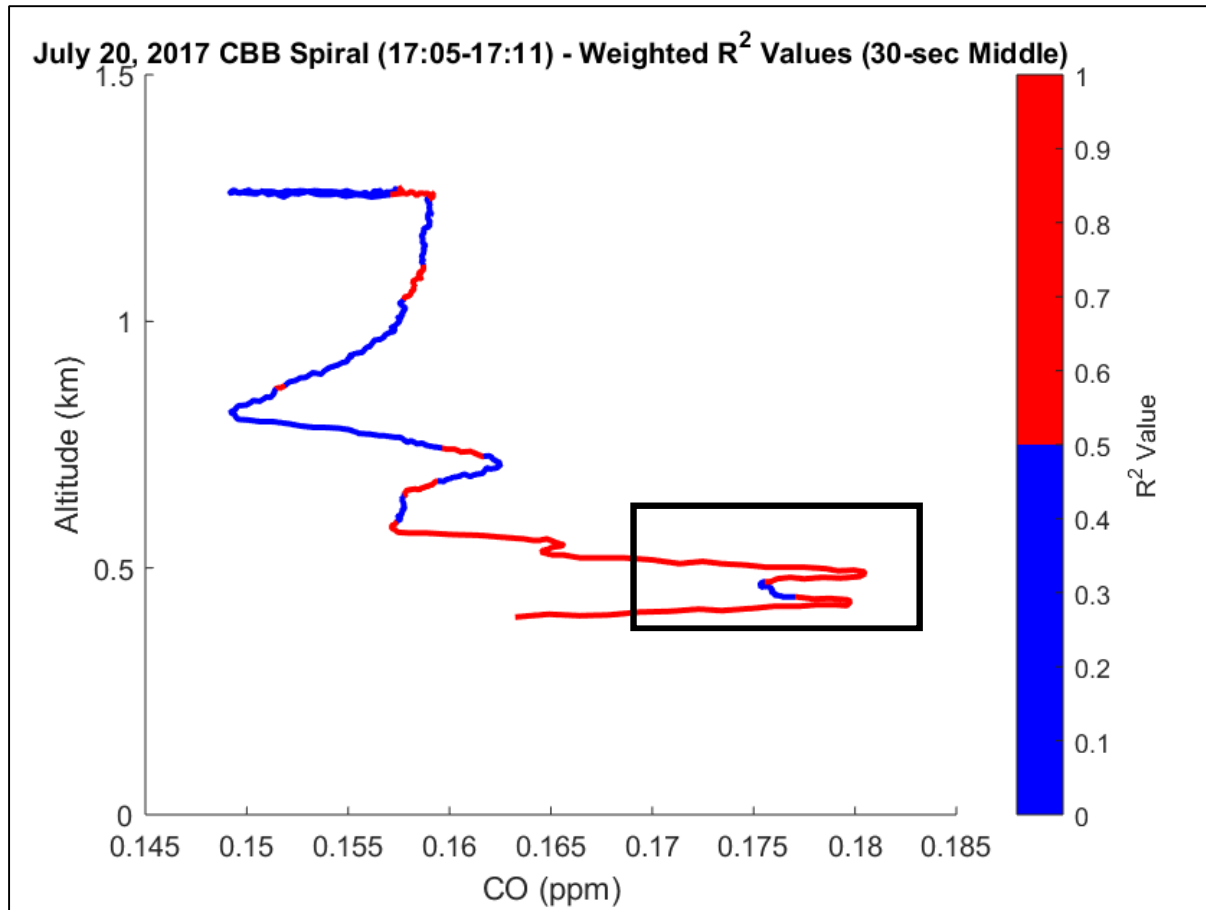
July 20, 2017 CBBT Spiral  
(17:05-17:11 UTC) - CH<sub>2</sub>O

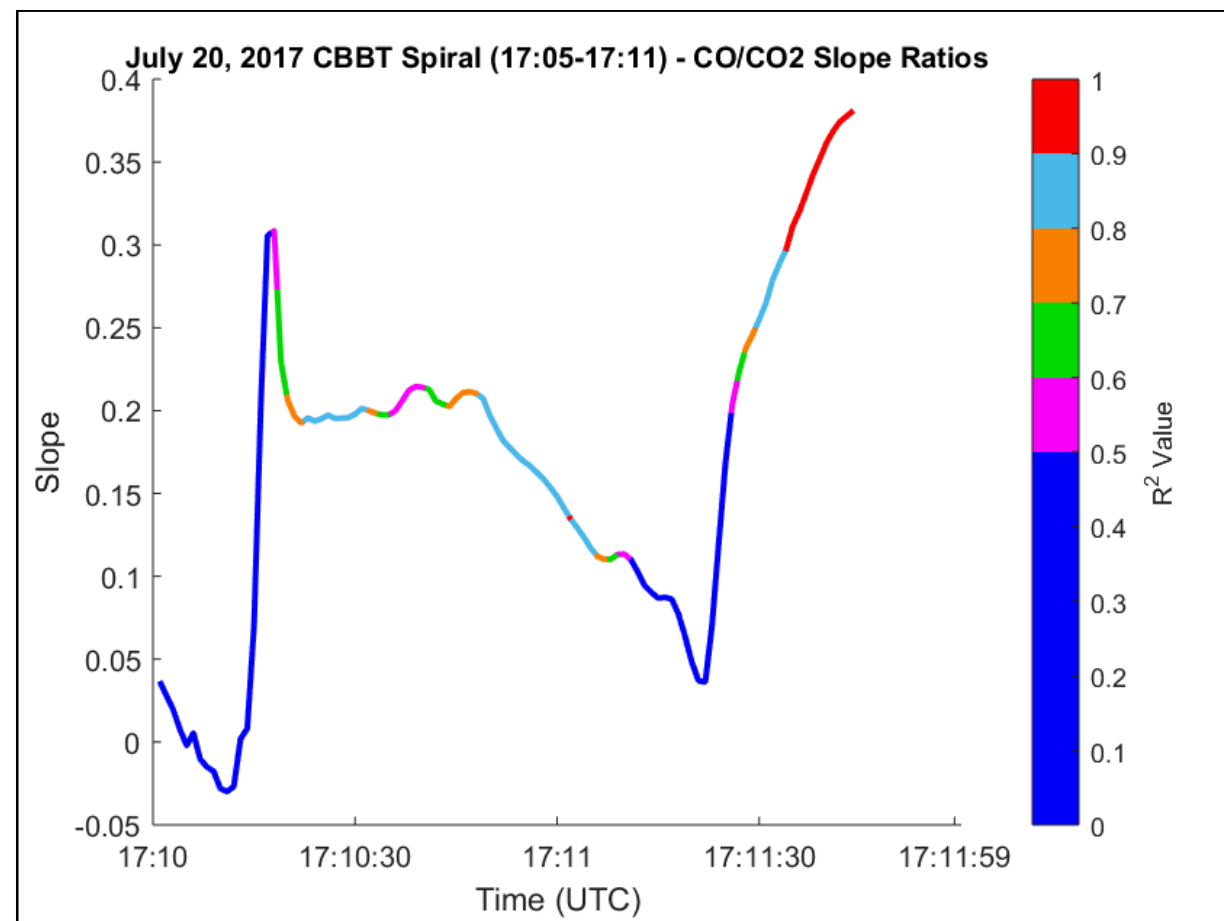
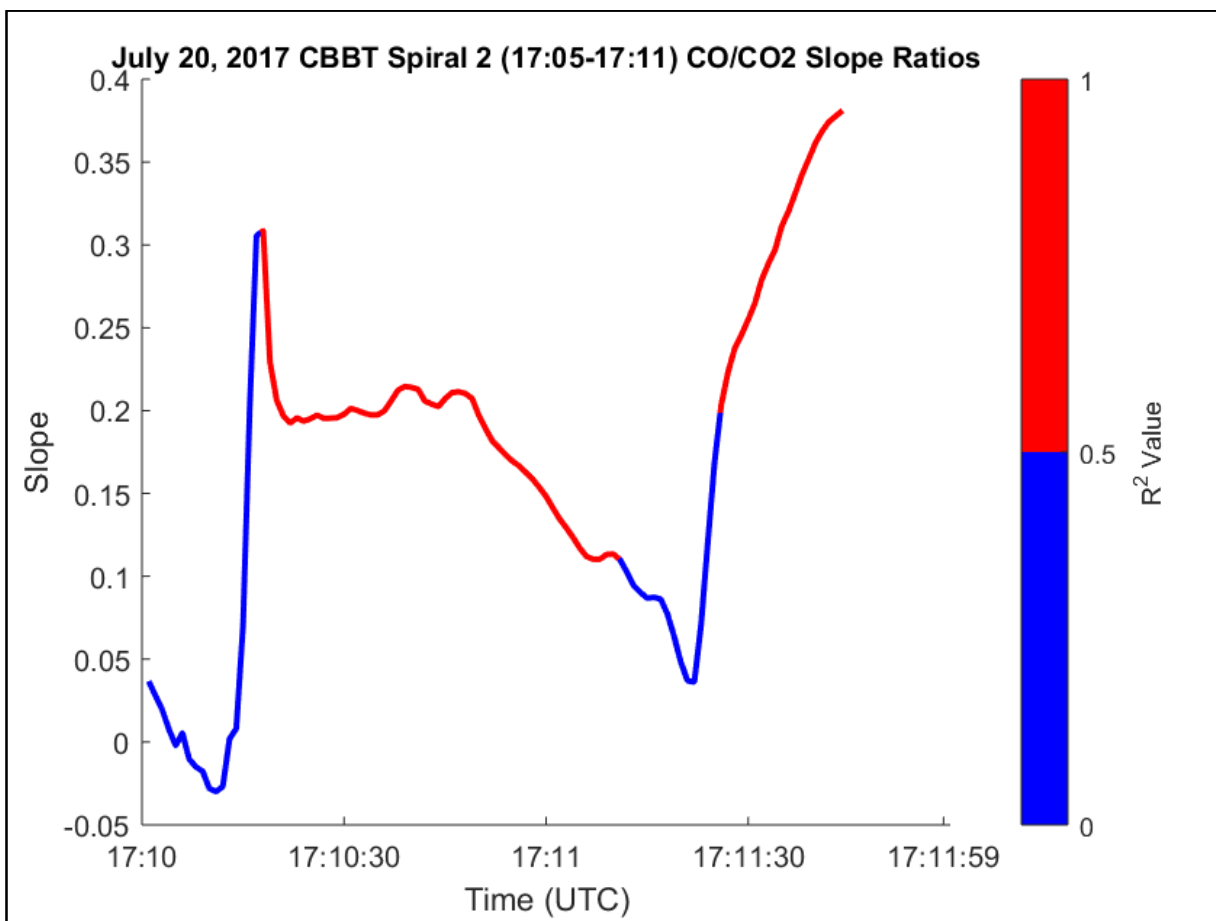


# CO/CO<sub>2</sub> Ratios

- Method utilized in Halliday et al., 2018 (in prep)
  - Ratio of CO to CO<sub>2</sub> provides information about the kinds of combustion occurring in a region (biomass, power plant, etc.)
  - Two different rolling windows (60 seconds and 30 seconds) ran over each flight
    - Slopes were calculated using weighted linear regressions
    - Correlation Coefficients
  - Slopes are reported as percentage values (ppm/ppm \* 100)
- Simplistic interpretation of combustion efficiency

# 30-Second Rolling Window





# Future Work

- Apply analysis to spirals conducted at other locations
  - Potentially interesting features in a couple spirals over Richmond/VCU
- How much will these features (such as plumes) affect satellite measurements (TEMPO, TROPOMI)?
- Integration of ship data
  - Acquired from the USCG
  - Currently being analyzed
- Possible upload of KMZ files and other analyses to the OWLETS-1 archive
- Presentation at AMS Annual Meeting

# Acknowledgements

- Hannah Halliday - NASA LaRC, USRA
- Amy Jo Scarino - NASA LaRC, SSAI
- Margaret Pippin - NASA LaRC
- John Sullivan – NASA GSFC
- SSAI and STARSS III