Once I was able to discern which fluxes were true fluxes, I used the following equations to I) calculate gas fluxes from concentrations collected over time, II) calculate each chamber surface area, and III) calculate total system volume for each chamber. I used a spreadsheet mostly derived from one created by Meghan Taylor to calculate the CH_4 fluxes:

Equations:

I. CH_4 Flux ($ug/m^2/h$) = ($mass_{end\ (mg)}$ - $mass_{start\ (mg)}$) / chamber surface $area_{(m\text{^}2)}$ / ($time_{(s)}$ / 60 / 60) * 1000

II. Chamber surface area = $a*b*r^2$ * (4-pi) * 0.00064516
a = length a (inch)
b = length b (inch)
r = corner radius (inch)
0.00064516 = Conversion from $inches^2$ to $meters^2$
(Figure 8).

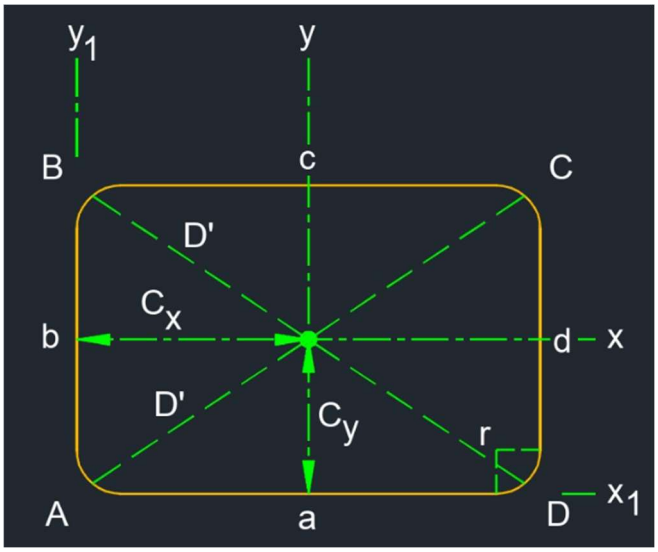

Figure 8. Visual representation of the rounded rectangle surface area equation used to calculate the surface area of each tree chamber. (Piping-Designer).

III. Total system volume for each chamber = $injection\ volume_{mL}$ * ($injection\ concentration_{ppm}$ / ($concentration\ end_{ppm}$ - $concentration\ start_{ppm}$)) / 1000) + (big drierite + filter volume)

- Note: Big drierite + filter volume = 858.47

(Siegenthaler et al., 2016)

I took the average of 3 separate controlled flux calculations (injection concentration = 200 ppm CH_4,, injection volume = 20mL CH_4) for each chamber to determine the chamber volume. The combined volume of the drierite columns and filter was determined by taking the average of the 3 controlled fluxes for one of the chambers both with the filled drierite column and filter attached to the closed system, and without both. The difference between these values was the total volume of the full drierite column and filter which was then added onto each individual chamber volume calculation. The total volume of the chamber and gas analyzer system was needed to calculate both the start and end masses for each observation. This was then used to calculate the final CH_4 fluxes for each observation (Jeffrey et al., 2019).

FINAL CHAMBER VOLUMES AND SURFACE AREAS		
Chamber ID	**Surface Area (m^2)**	**Chamber Vol (m^3)**
A	0.00404331183	0.001192269
B	0.01076874792	0.001480324
C	0.02133452731	0.002256472
D	0.04622028992	0.004224676

Figure 9. Final chamber volume and surface area used in the flux calculations for each chamber type used in October 2022. Chamber size increases alphabetically (i.e. chamber A < chamber B < chamber C < chamber D).

The ground team in-situ field data collection will eventually be upscaled by each tree, each site, and for the entire Caribbean region using NASA flight team data and LTER eddy covariance tower data. We will do this as a collective for all three trips to look at impacts of seasonality, disturbance, and other factors on CH_4 and other greenhouse gas fluxes in the region.