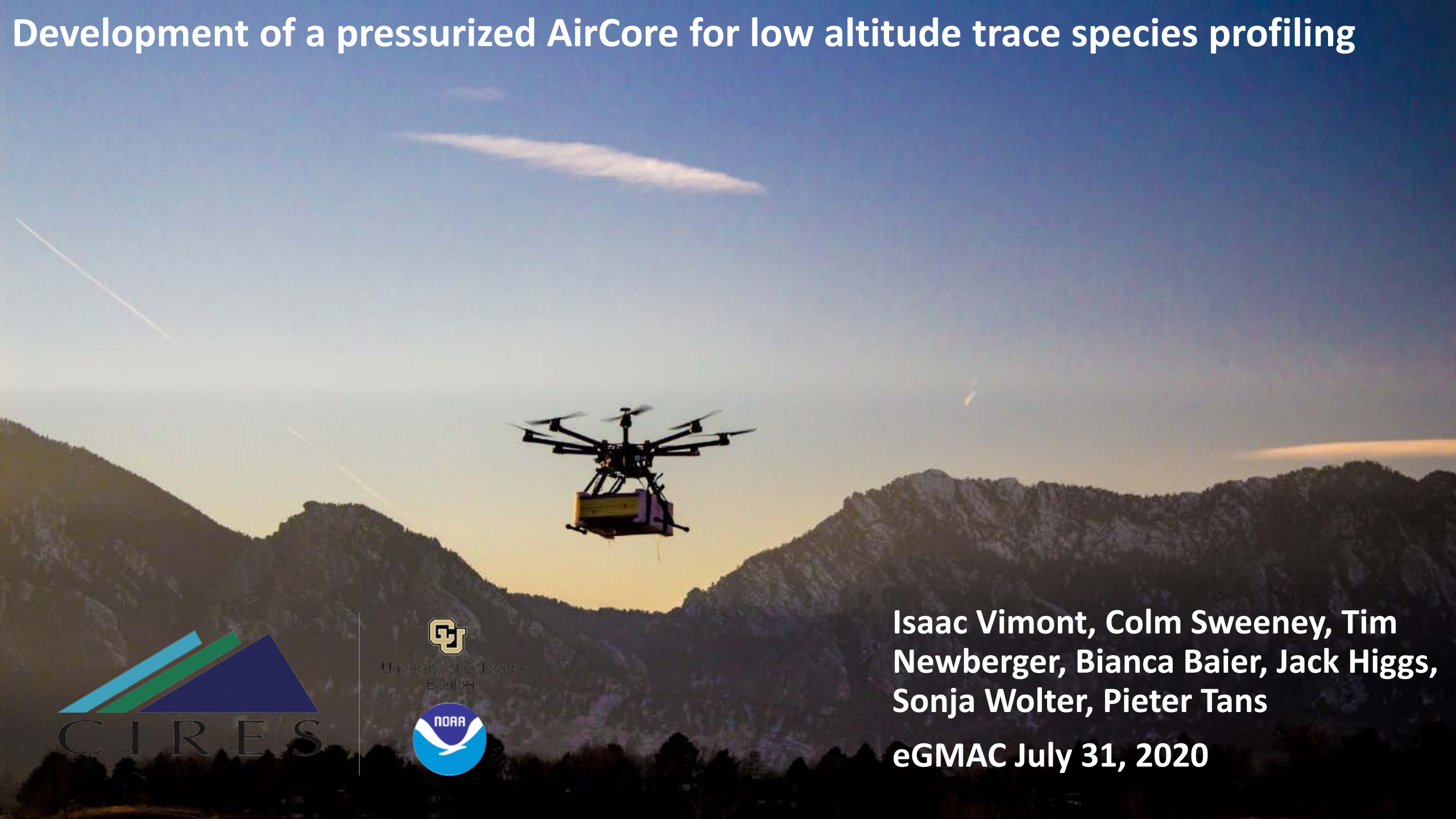
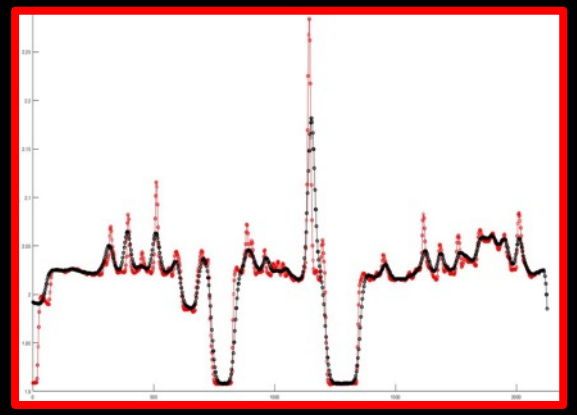
Development of a pressurized AirCore for low altitude trace species profiling

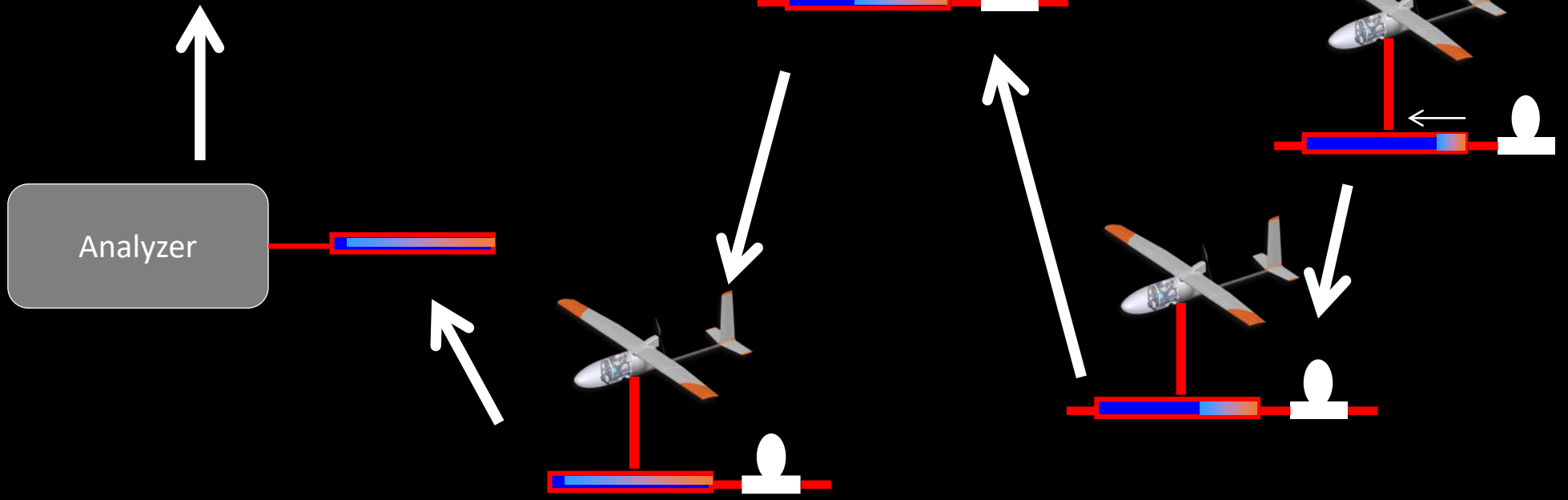


Isaac Vimont, Colm Sweeney, Tim Newberger, Bianca Baier, Jack Higgs, Sonja Wolter, Pieter Tans

eGMAC July 31, 2020

Pressurized AirCore concept



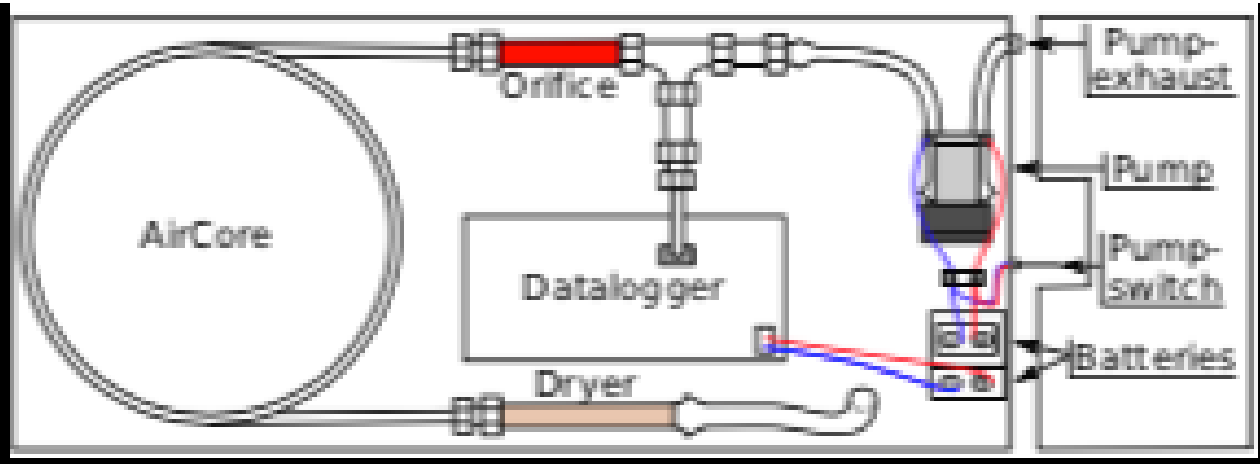


A variation on previous samplers

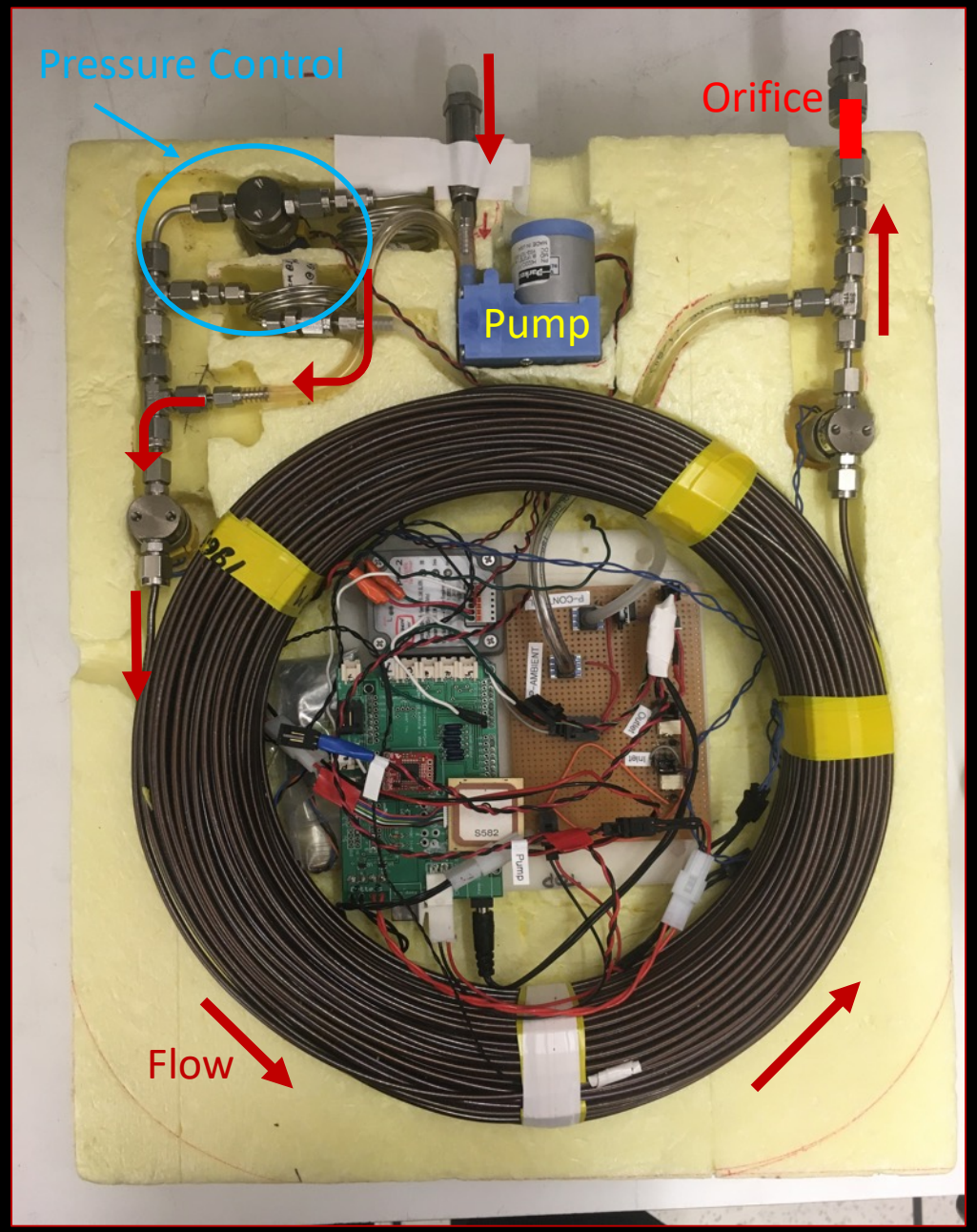
A UAV-based active AirCore system for measurements of greenhouse gases

Truls Andersen[1], Bert Scheeren[1], Wouter Peters[1,2], and Huilin Chen[1,3]

[1]Centre for Isotope Research (CIO), Energy and Sustainability Research Institute Groningen (ESRIG), University of Groningen, Groningen, the Netherlands
[2]Meteorology and Air Quality, Wageningen University and Research Center, Wageningen, the Netherlands
[3]Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, Colorado, USA

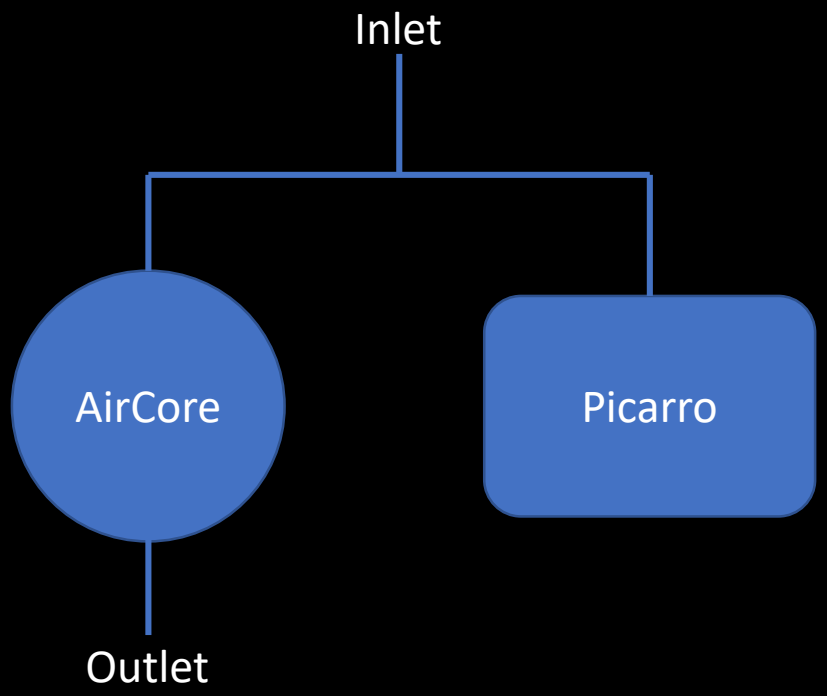


We have finalized a lightweight, UAS capable prototype

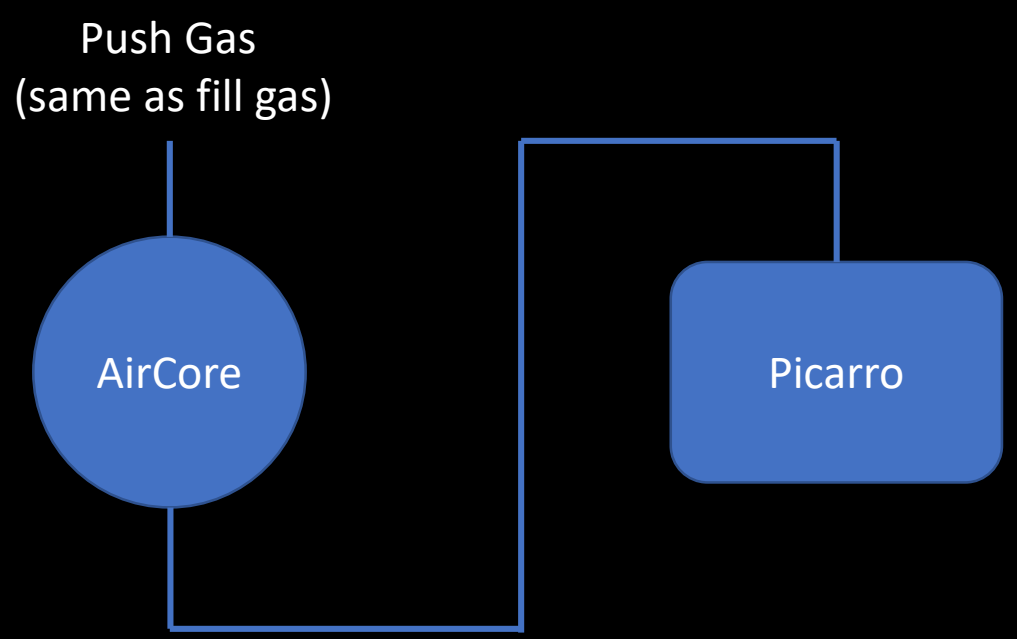


Testing: Sampling and analysis set up.

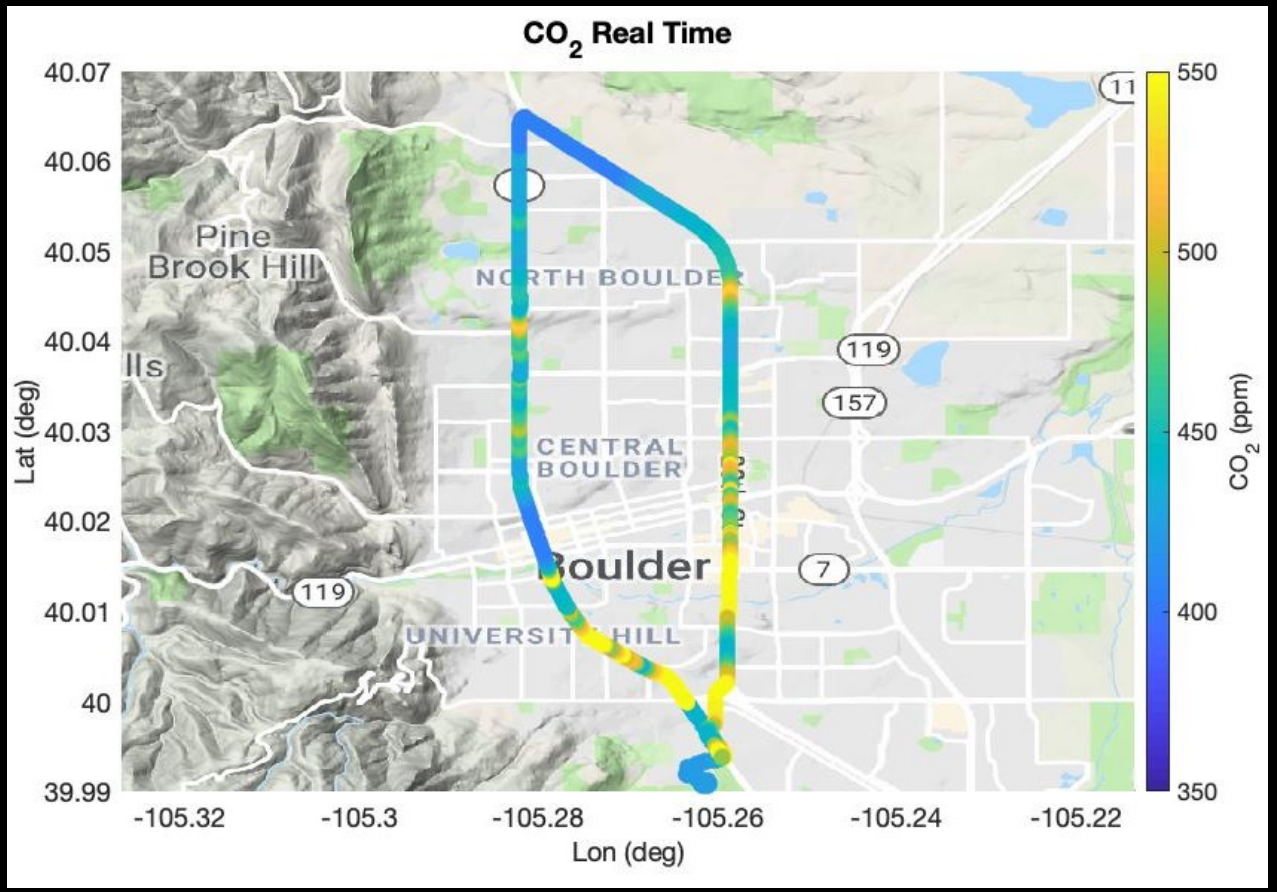
Sample Collection

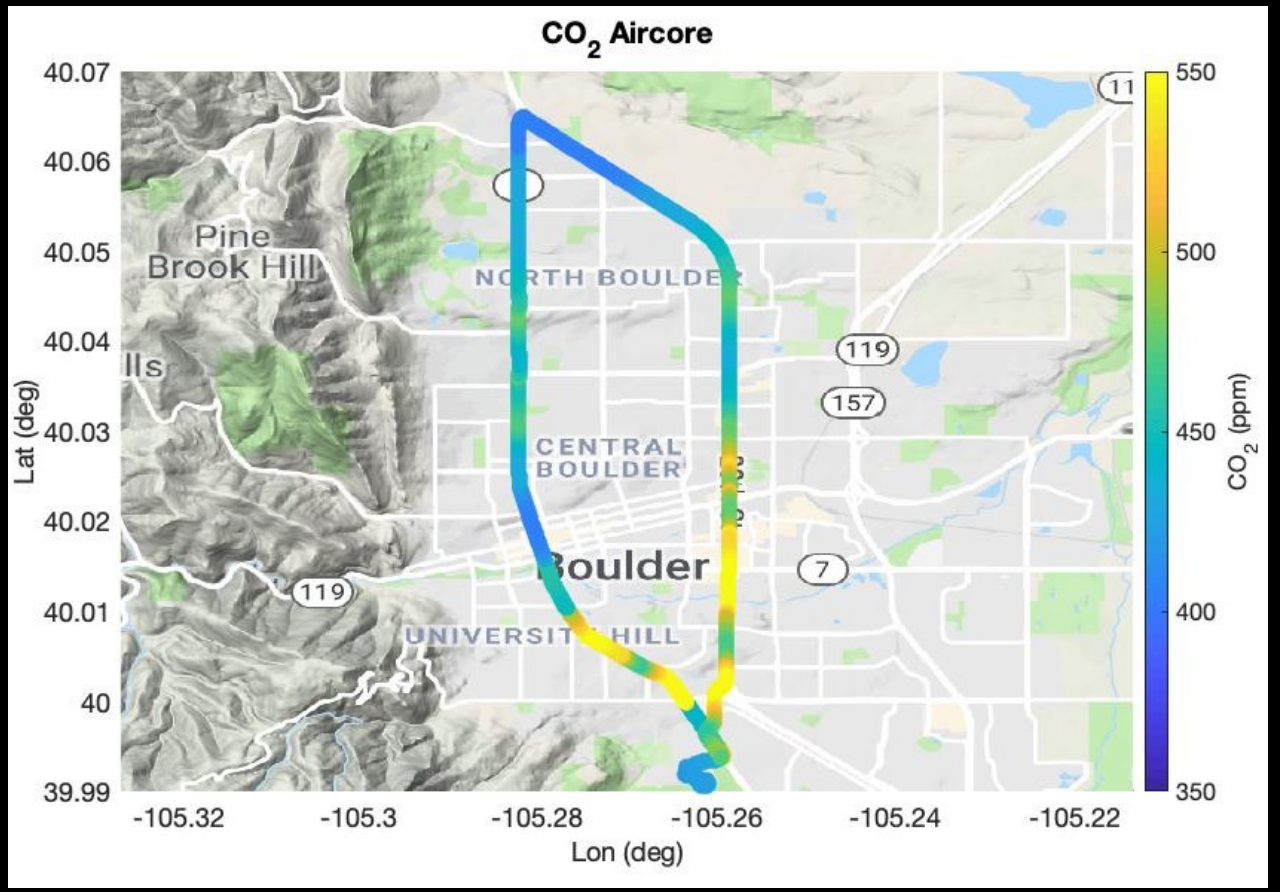


Sample Analysis



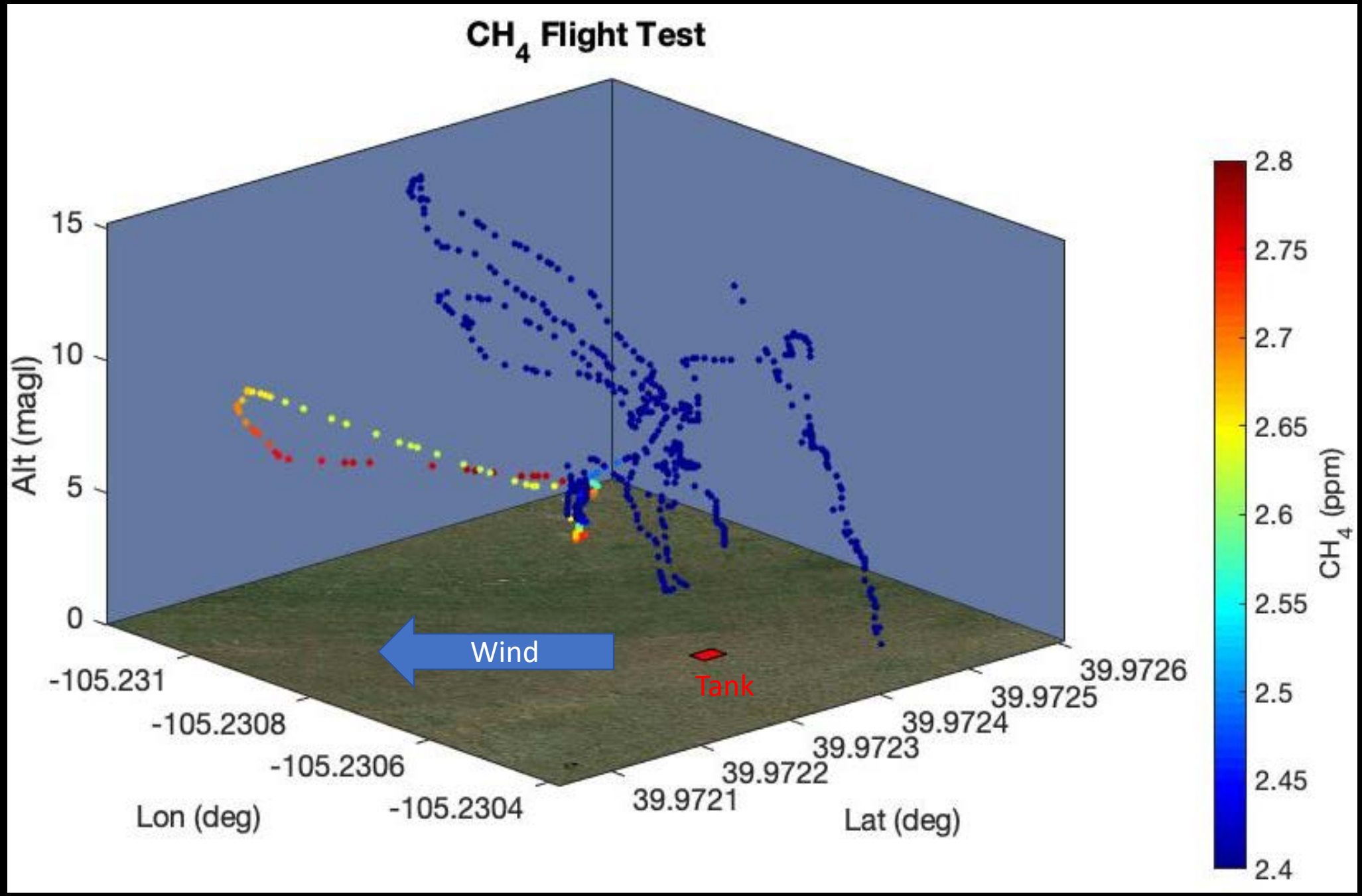
Co-Sampled around Boulder



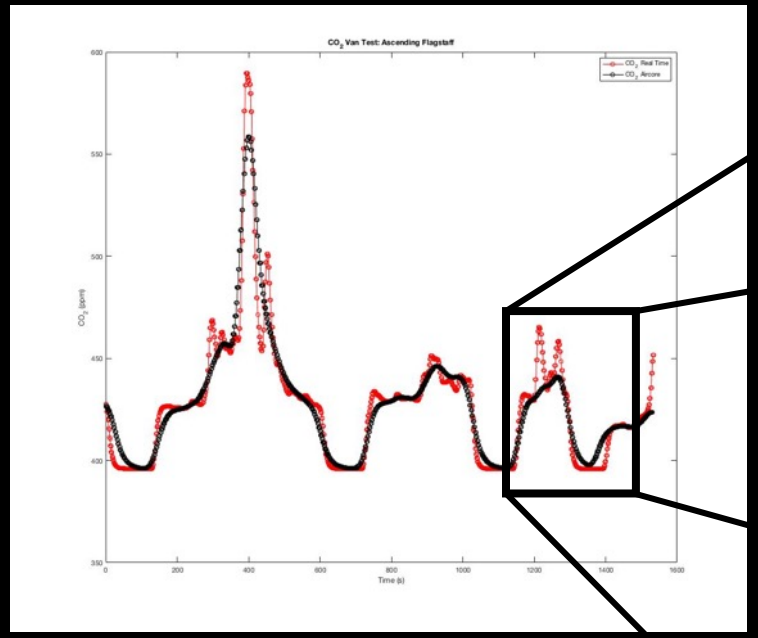


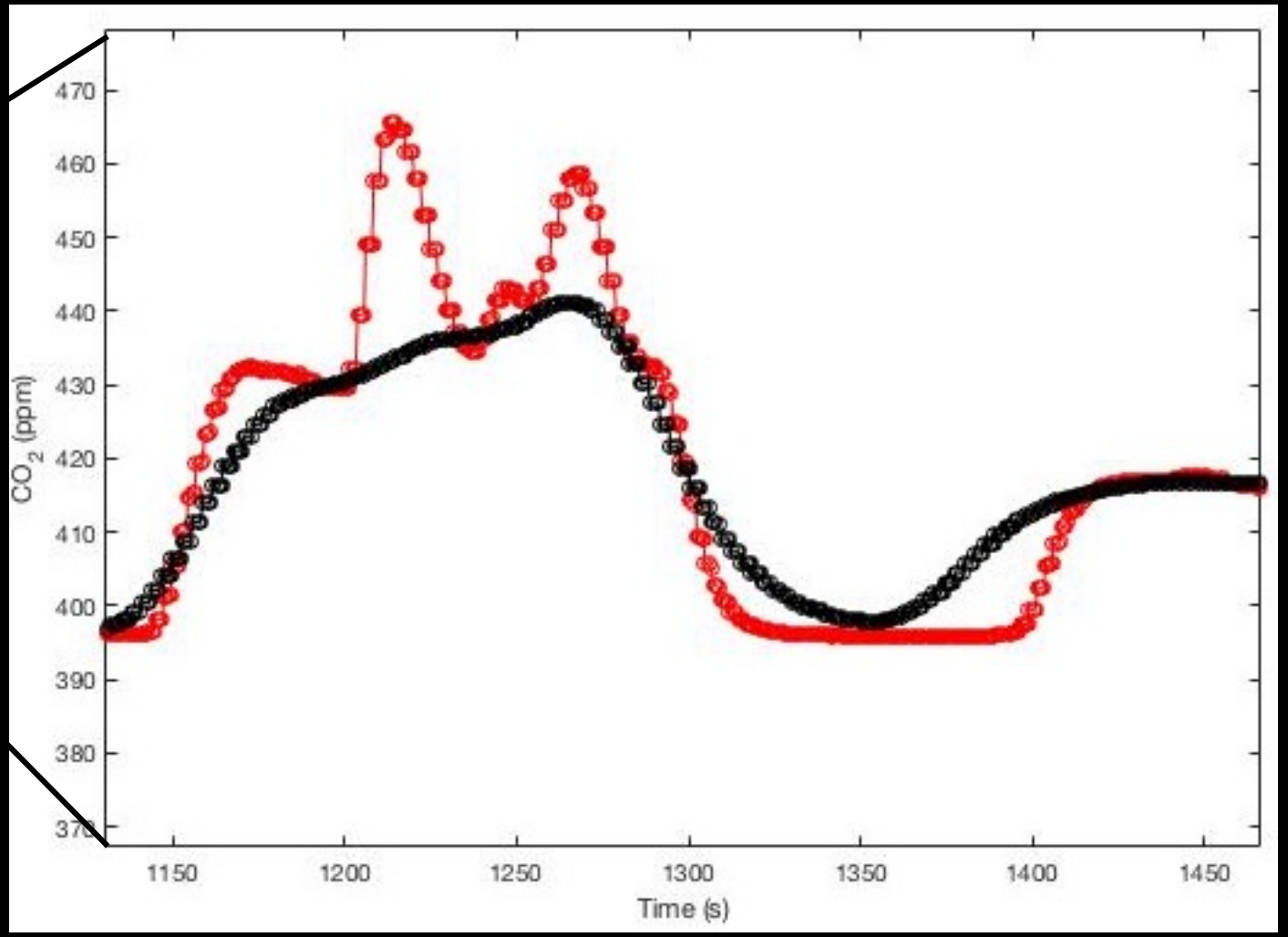
Initial Flight Testing

Test Flight:

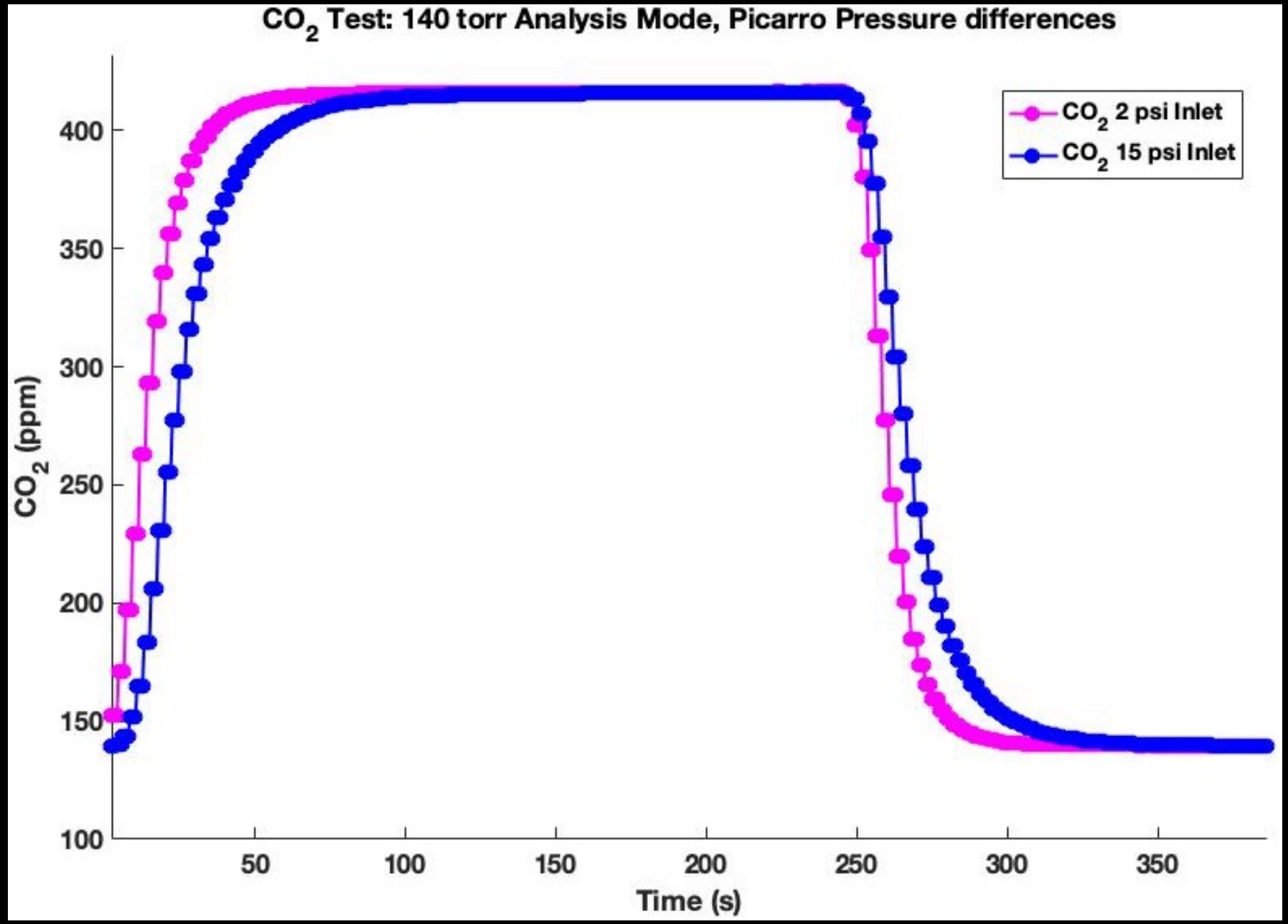

CH4 Flight Test
Alt (magl)
15
10
5
0
-105.231
-105.2308
-105.2306
-105.2304
Lon (deg)
39.9721
39.9722
39.9723
39.9724
39.9725
39.9726
Lat (deg)
Wind
Tank
2.8
2.75
2.7
2.65
2.6
2.55
2.5
2.45
2.4
CH4 (ppm)

During initial lab and vehicle tests, we encountered a signal smearing issue…

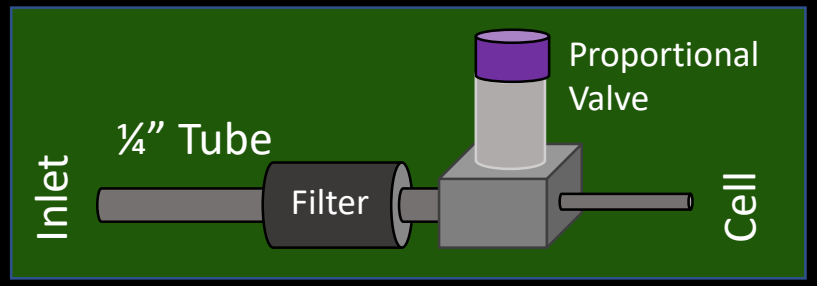


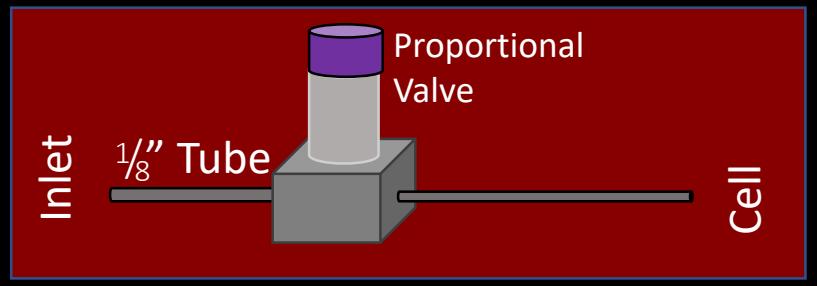


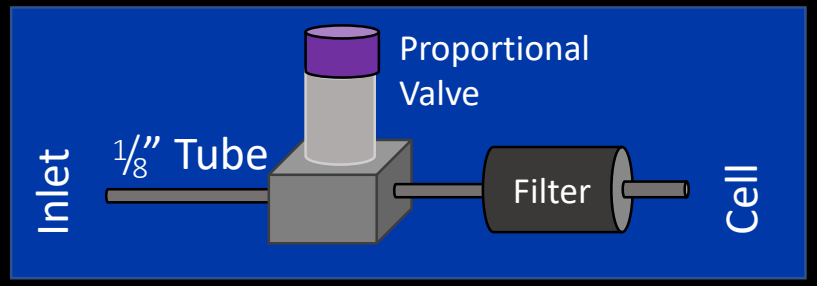
The inlet pressure was playing a role

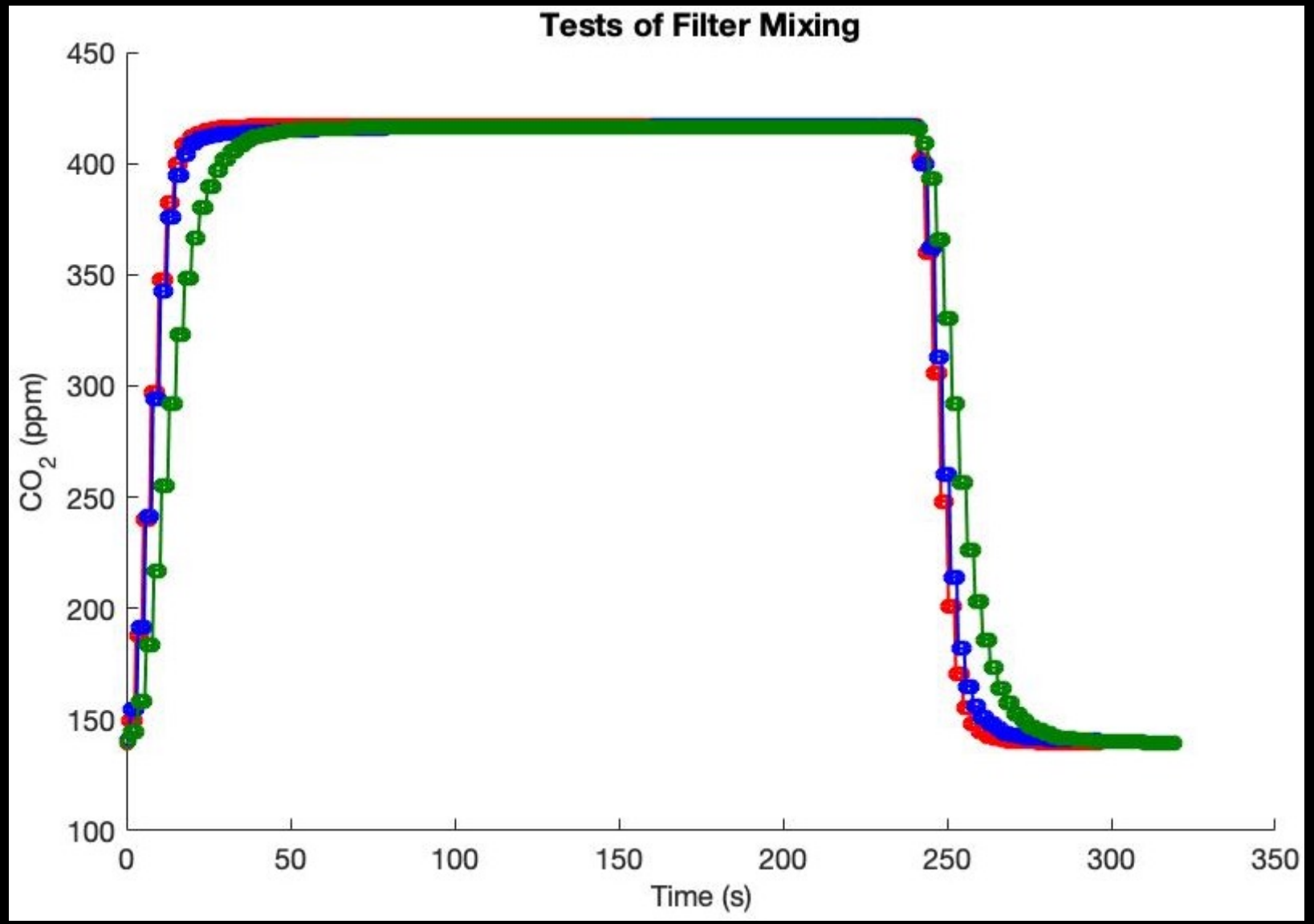


Why? → Picarro Inlet Filter

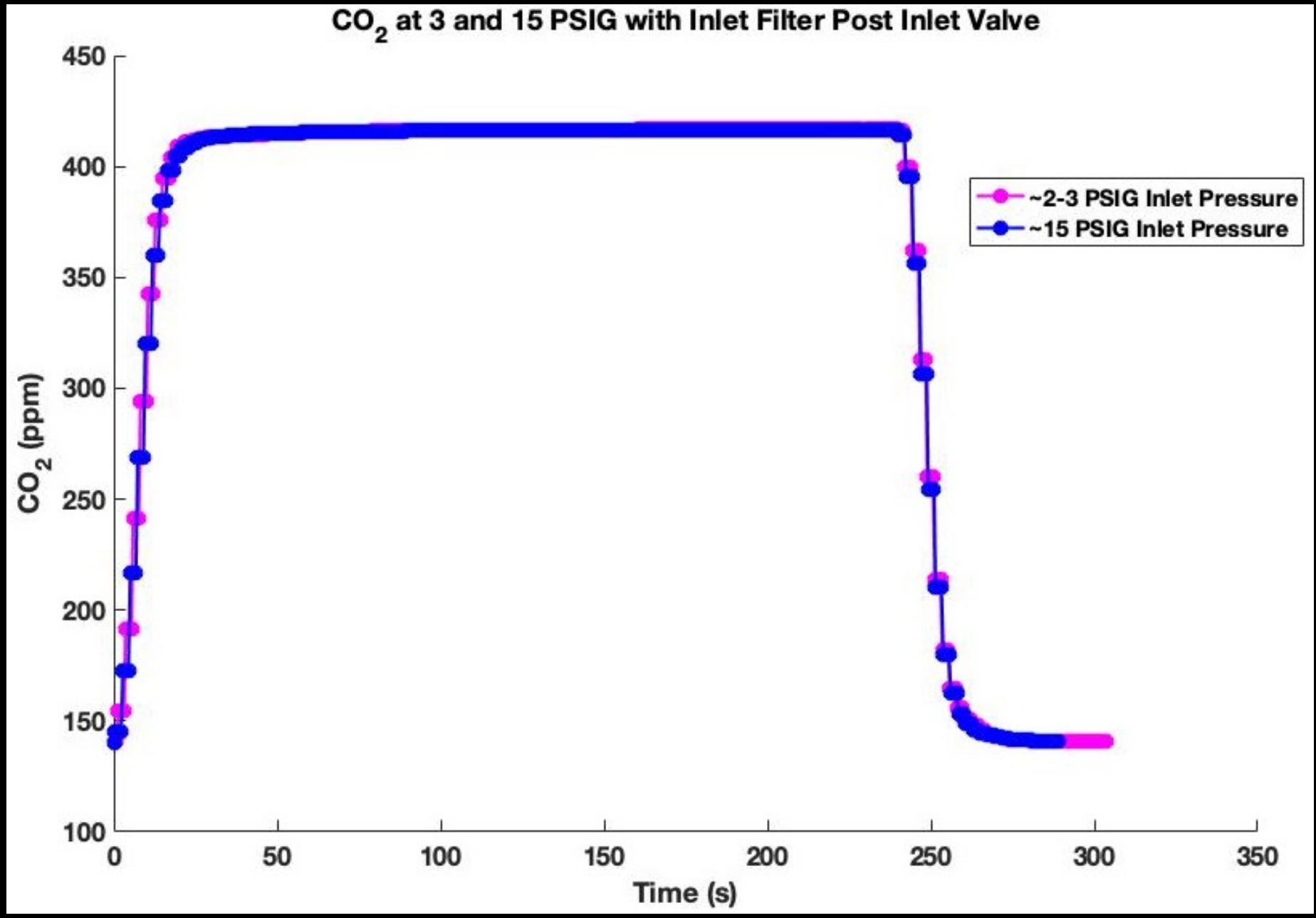




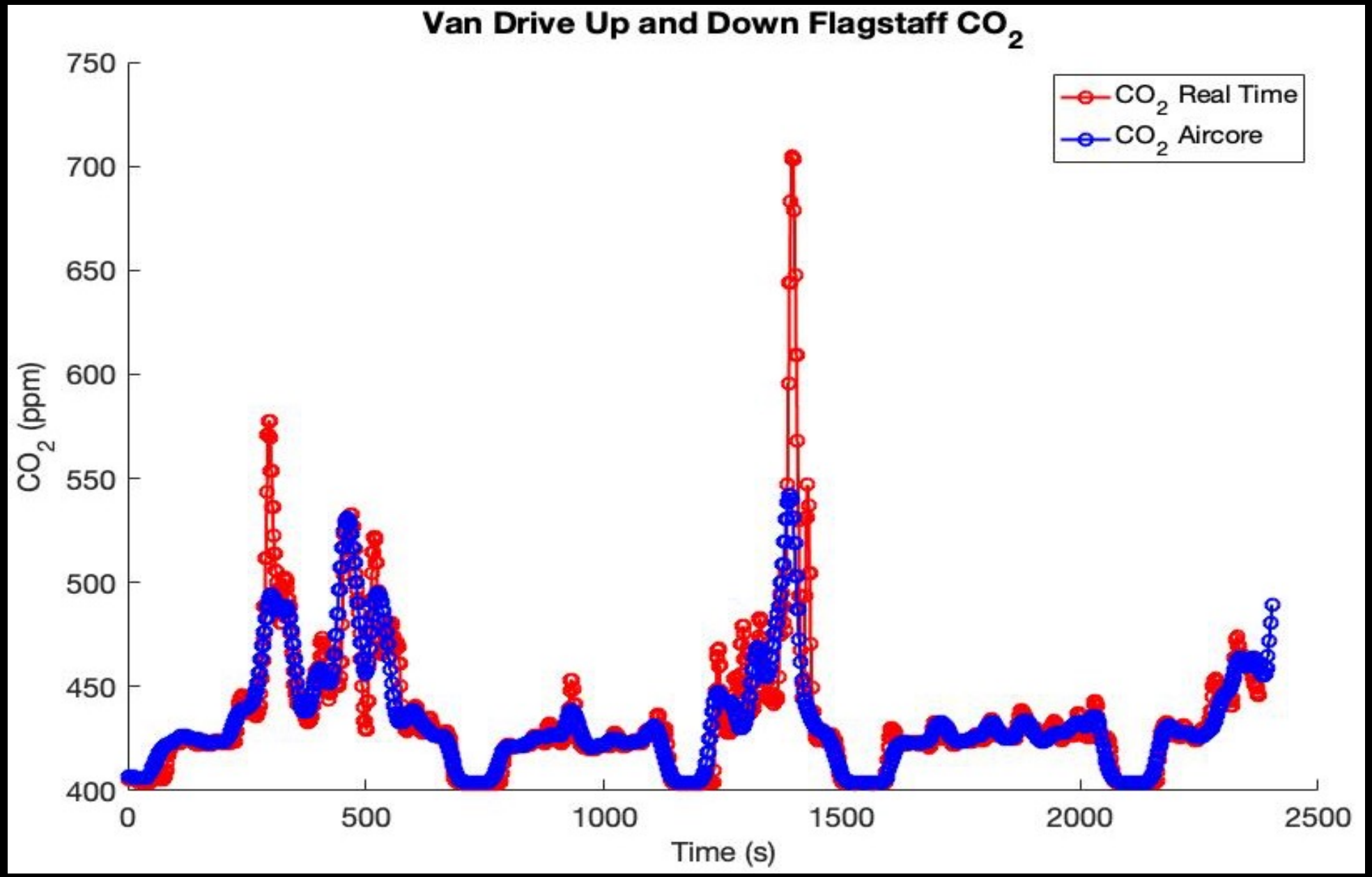




Post Filter Change



We now see symmetrical smoothing consistent with diffusion



Thank you!!