



Volatiles in Kilauea Iki (1959)

by Auden Reid-McLaughlin

Working with Charlotte Devitre (and lots of help from Kyle)

Overview

1. Iki Eruption
2. Volatiles and Volcanism
3. My Research Project
 - a. Picking Melt Inclusions
 - b. Raman Analysis
 - c. CO₂ Calculation
4. Conclusions and Next Steps



Iki Eruption

- Iki: volcanic crater next to summit of Kilauea
- Earthquake swarm precursor three months before eruption began
- 17 step sequence lasting from 11/14 to 12/20/59
- Produced highest fire fountains ever recorded in Hawaiian history



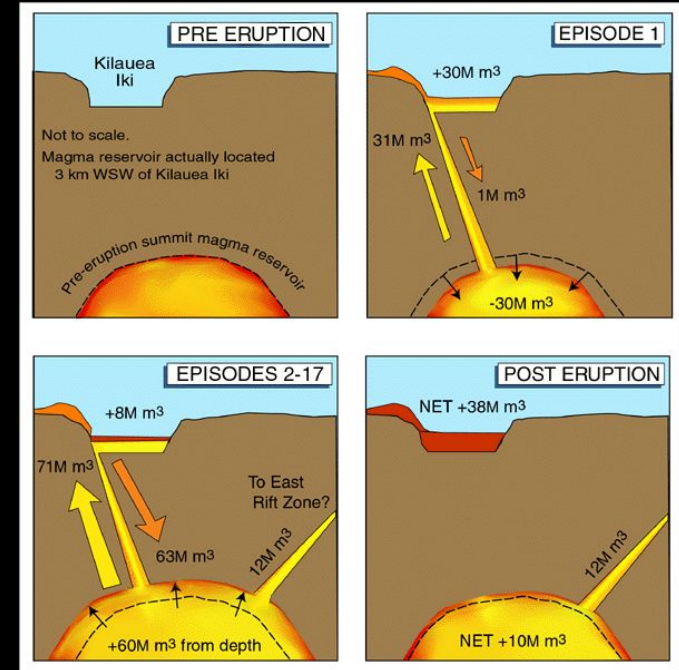
Highlight Reel:

Ep. 8: Lava lake deepest (126 meters),

Ep. 15: highest fire fountain (580 m),

Ep. 17: Erupting 1.85 million cubic meters of lava per hour

Lava Whirlpools





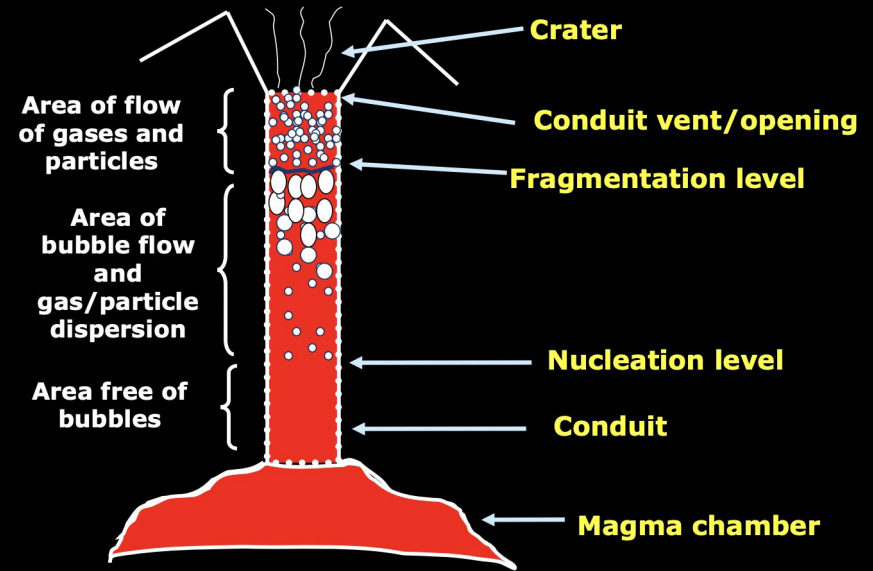
Review of Volatiles and Volcanism

What are volatiles?

Why are volatiles important to volcanic eruptions?

How do we measure initial volatile content?

What is a melt inclusion?

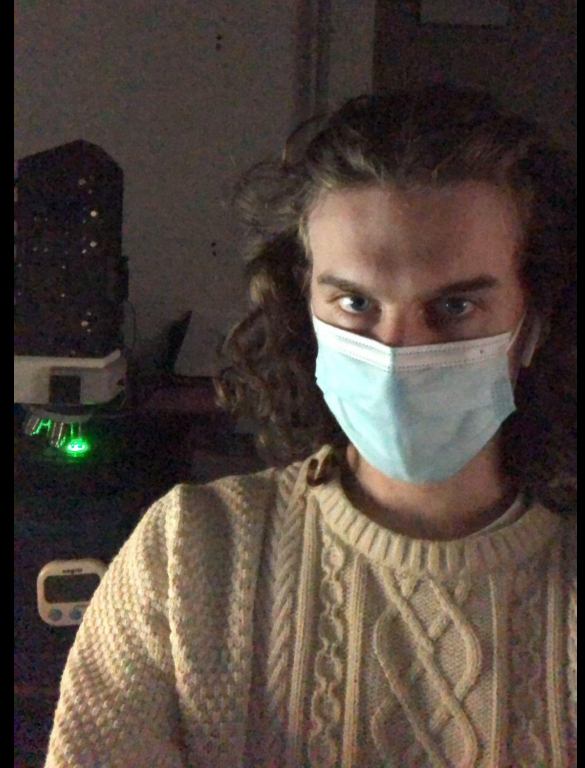


My Research Project!

Project: Analyzing Iki Melt Inclusions for CO₂, H₂O, and Carbonate Content

Steps:

- 1) Picking Samples
- 2) Mounting and Polishing
- 3) Raman spectroscopy
- 4) Analysis and calculation of CO₂ content



Picking Melt Inclusions

What do we consider in looking for a good melt inclusion?

-Decrepitation

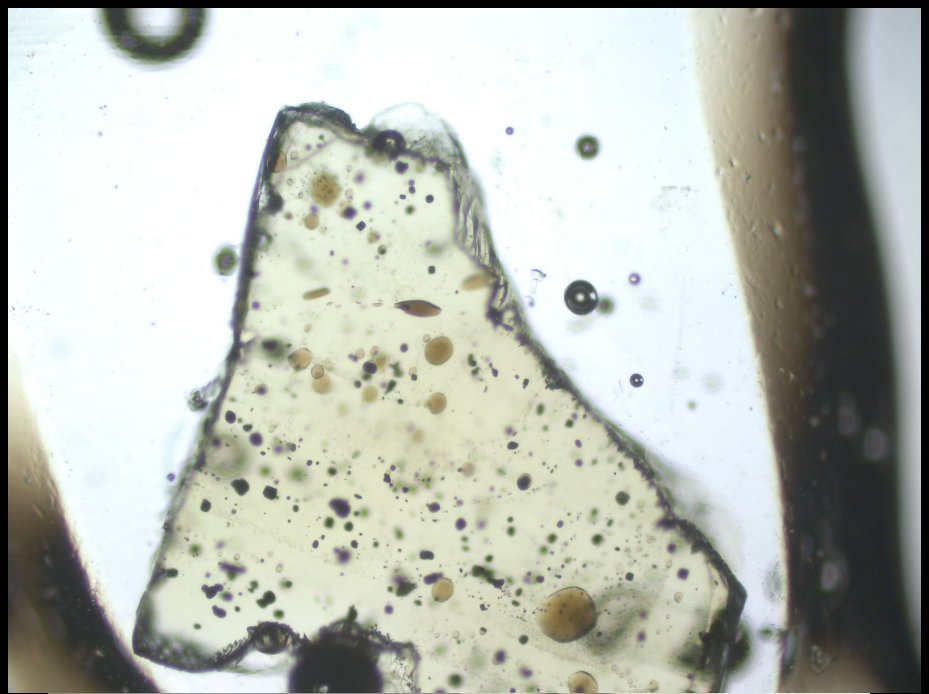
- Lost volatiles

-Vapor Bubble

- Hosts volatiles

-Size

- Too small vs too big



RAMAN Analysis

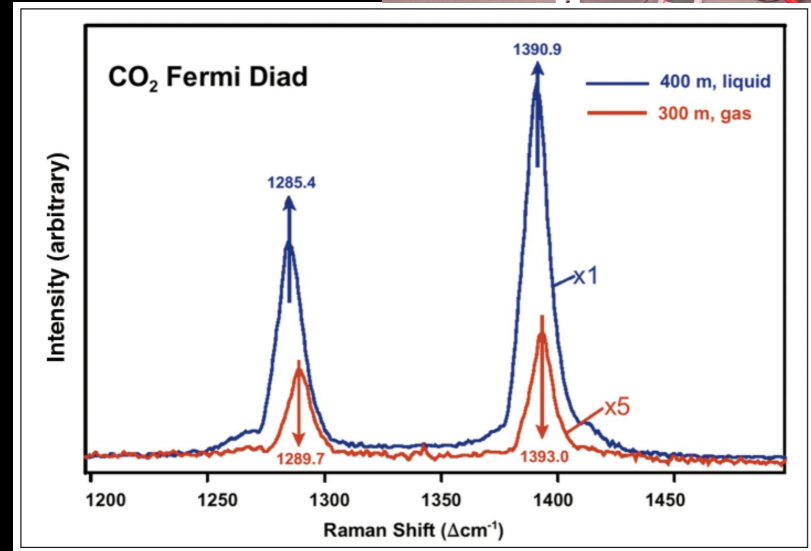
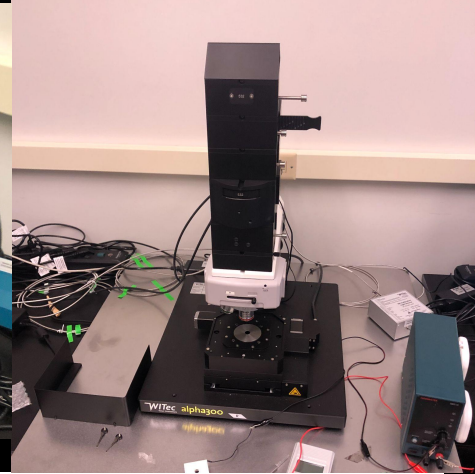
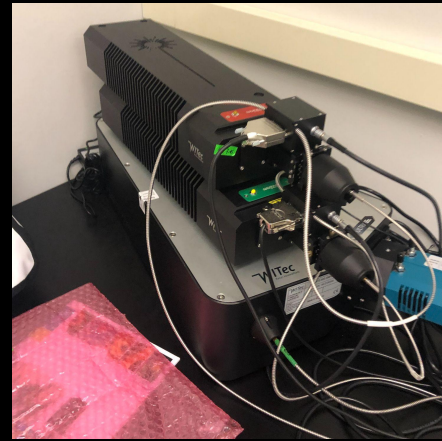
Spectroscopic technique that uses Raman Scattering

Outputs spectrum of intensity versus frequency

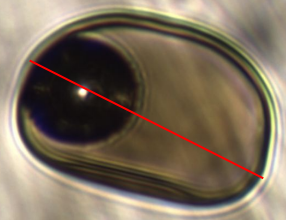
CO₂ double peak at ~1388 and 1286 (Fermi Diad)

Of 49 melt inclusions:

- 4 with CO₂
- 1 with carbonate (peak at 1093)



Sample 3.1



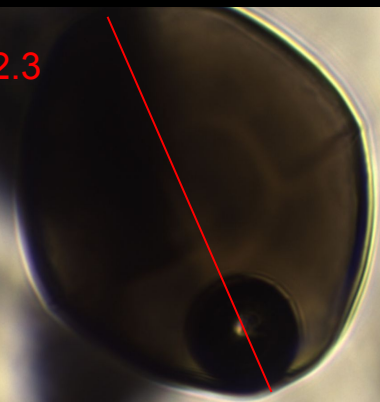
47.58
microns

Sample 10.1



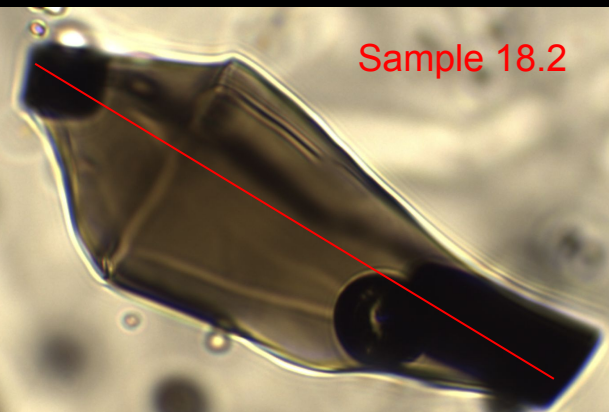
22.14
microns

Sample 12.3

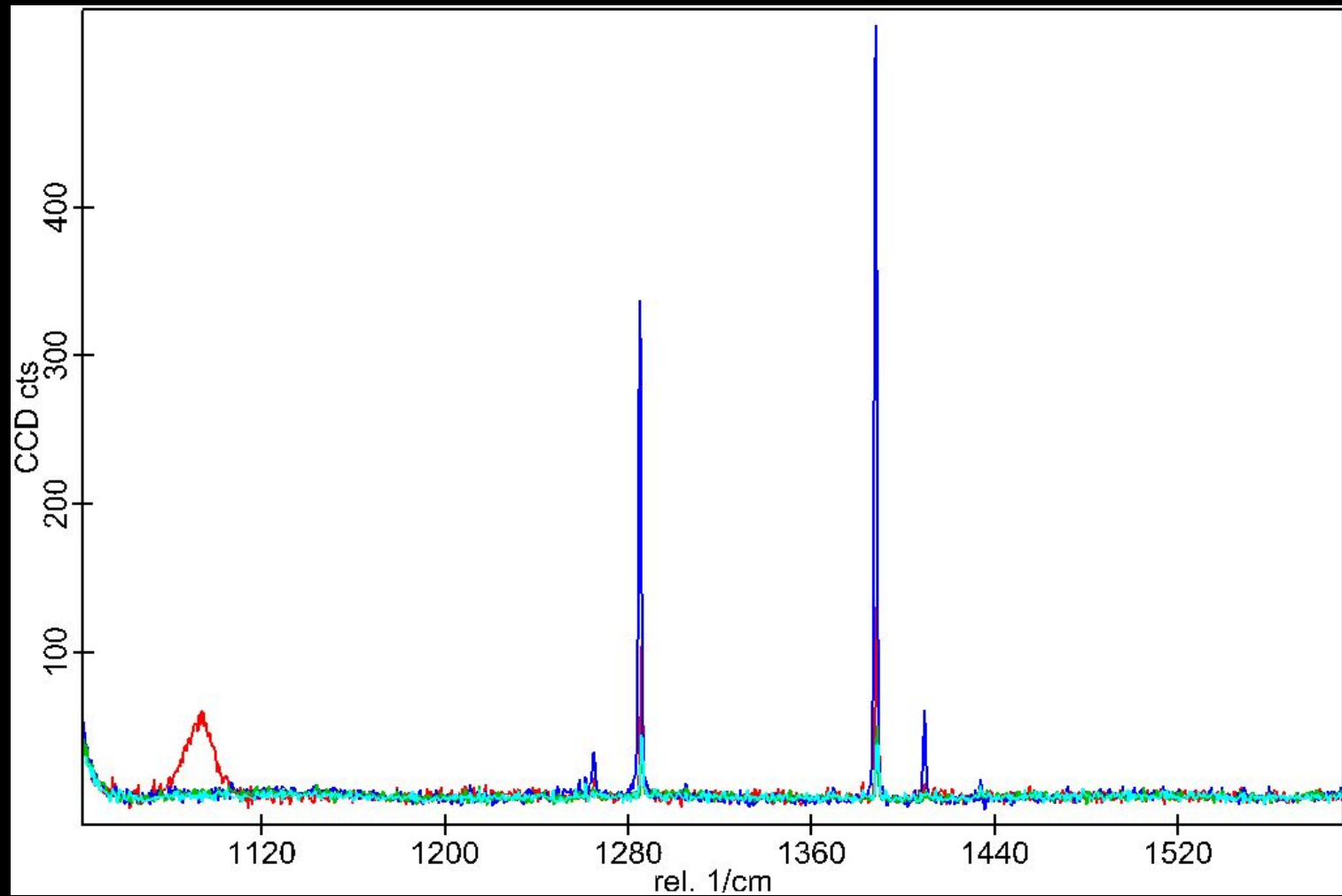


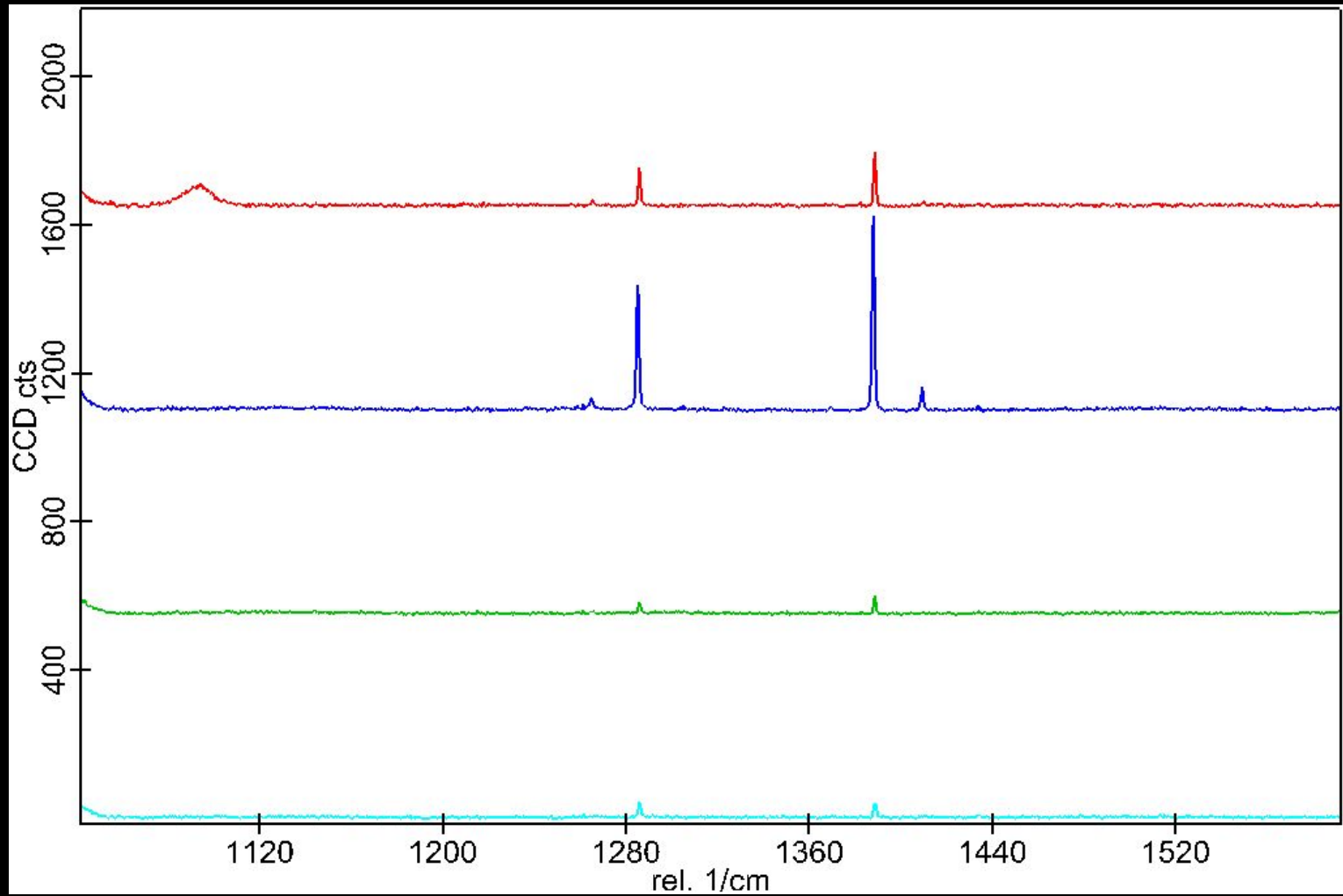
87.71
microns

Sample 18.2

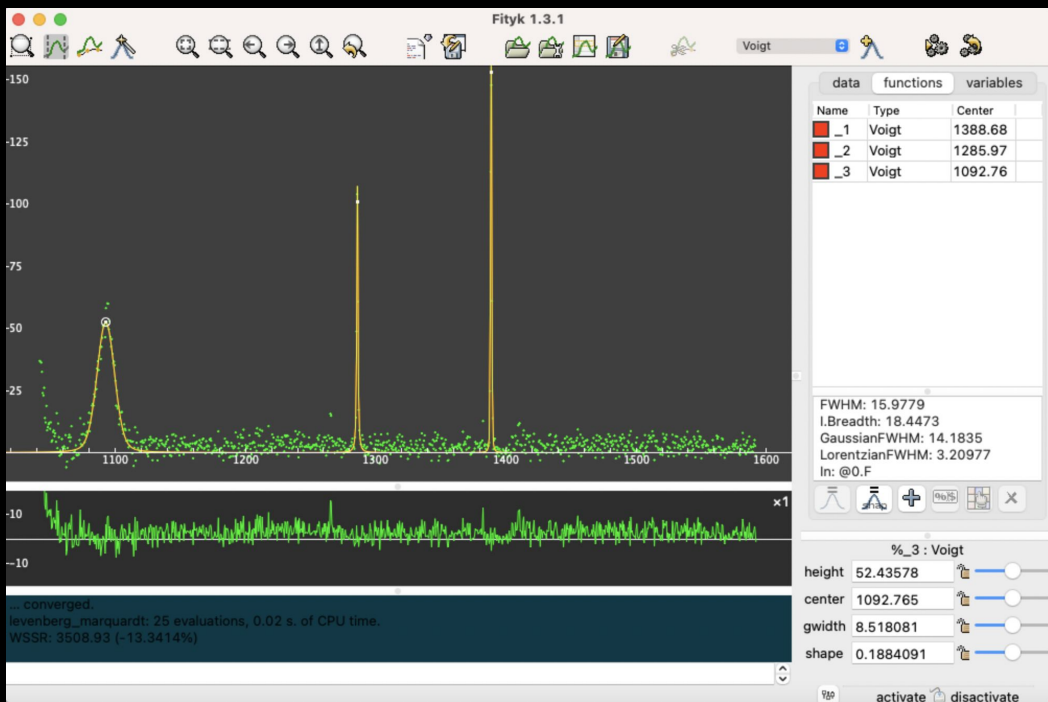


125.53
microns

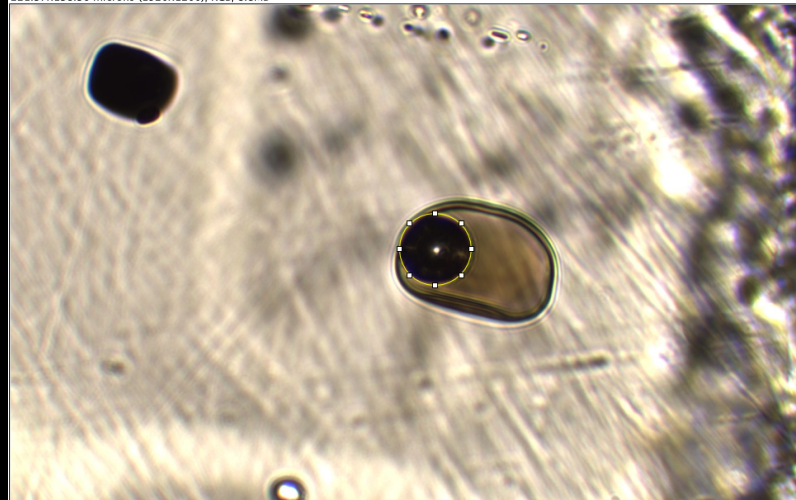




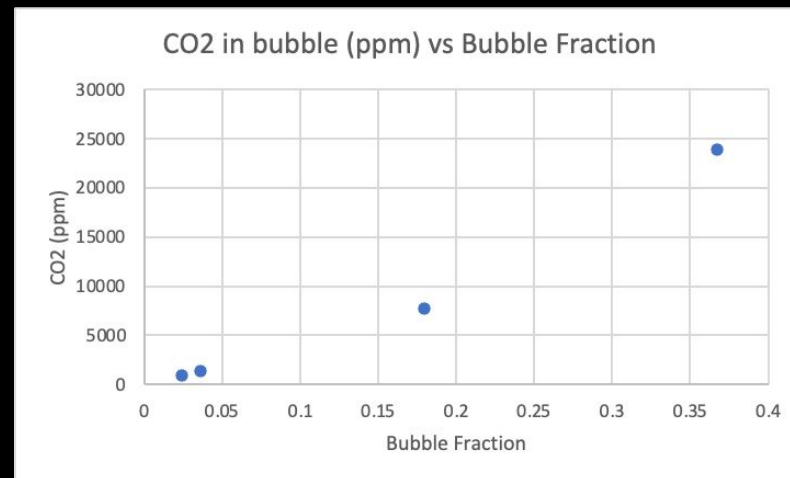
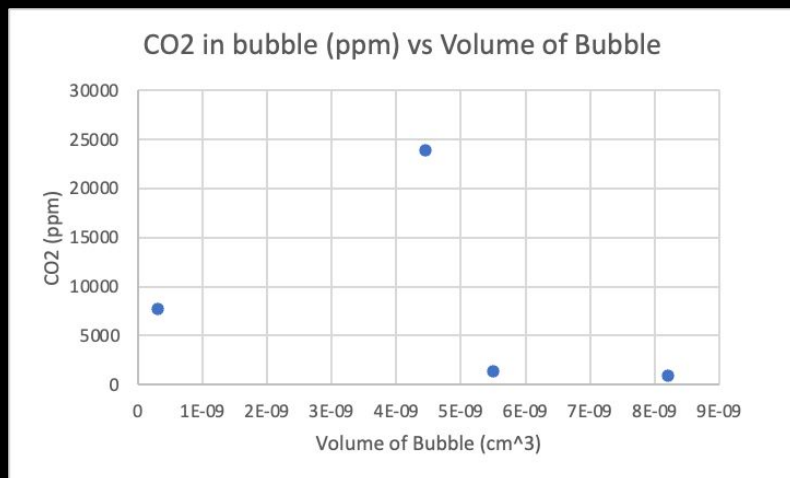
CO2 Calculation



221.37x138.36 microns (1920x1200); RGB; 8.8MB



CO2 Calculation



inclusion	volume bubble (cm ³)	volume inclusion (cm cubed)	co2 density	bubble fraction	CO2 in bubble (ppm)
3.1	4.4548E-09	1.21286E-08	0.11532567	0.36730044	23910.6759
10.1	3.1323E-10	1.74506E-09	0.09872151	0.17949491	7713.023
12.3	8.2068E-09	3.39905E-07	0.09760476	0.02414435	862.467852
18.2	5.5041E-09	1.53837E-07	0.10092066	0.03577892	1337.43512

Conclusions and Next Steps

High levels of CO_2 present in two inclusions with large bubble fraction, possibly entrapped an exsolved gas phase, bubble fraction could indicate heterogeneous entrapment

Presence of carbonate in one inclusion, could indicate underreporting of CO_2 content in Iki melt inclusions.

- 1) Re-analysis of high CO_2 inclusion
- 2) Homogenization experiment
- 3) Water Analysis





Thank you! Questions?

Time Stamps (11:20, 16:30)

