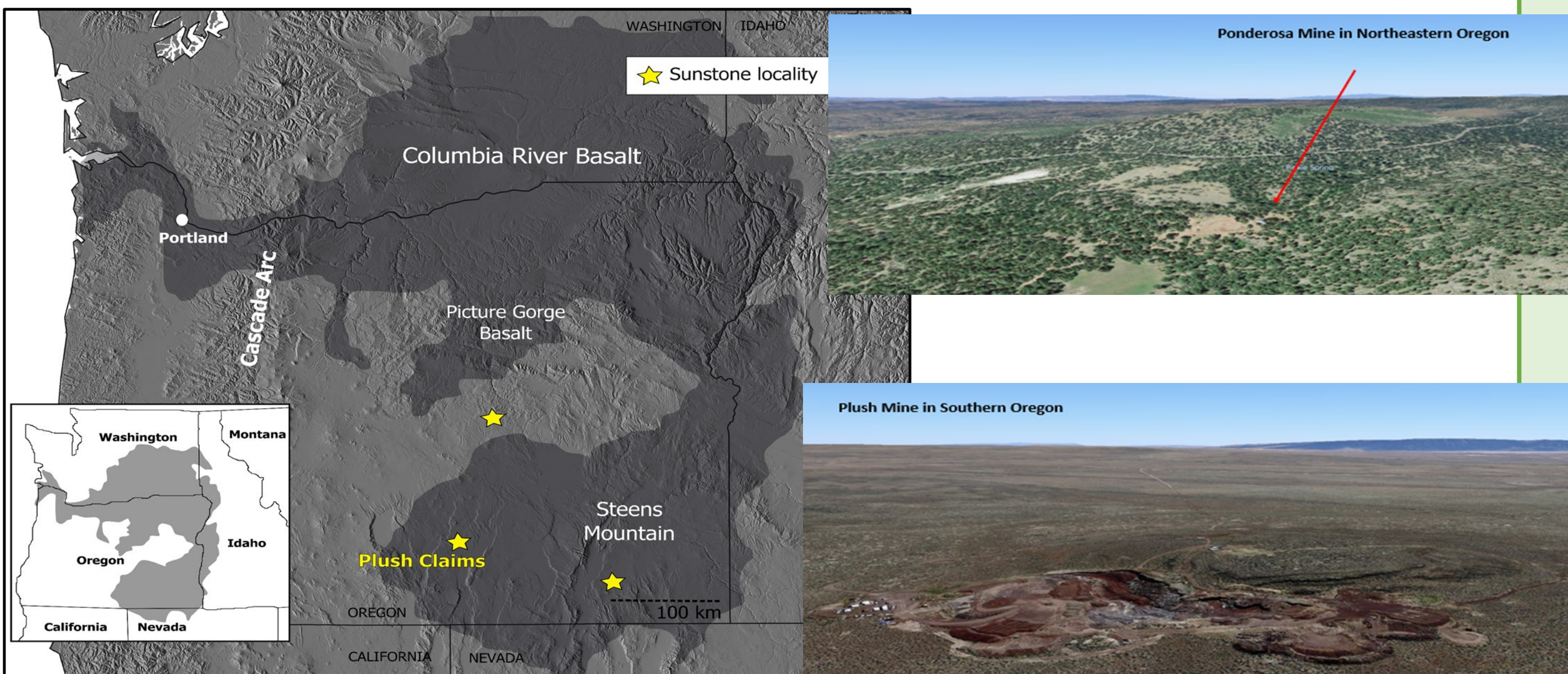


# Argon Incremental Heating as an Identifier of Age-Related Oddities between Plagioclase and Groundmass in Eastern Oregon

Kyle Nunley, Emily Cahoon, Daniel Heaton, Scott Toney & Cheyenne Yost  
College of Earth, Ocean and Atmospheric Sciences, Oregon State University



## Sunstones

Unique gem to eastern Oregon, sunstones are labradorite crystals (An<sub>50</sub> to An<sub>70</sub> plagioclase feldspar) that consist of schiller, which are macro-inclusions of copper (up to 300 ppm), visible as platelets, or “schiller,” that occur along the long axis of the crystal lattice. These large labradorite crystals (up to ~10 cm) exhibit clear, yellow, green, red, and sometimes pleochroic coloration.

Sunstones are copper-bearing plagioclase feldspar crystals found in basaltic lava flows in eastern Oregon. Sunstone-bearing lavas are found in two discrete locations ~150 km apart, both located within the spatial extent of the Columbia River Basalt Group (CRBG). In addition to being spatially distinct, preliminary geochronological work suggests these unique basaltic lavas are also temporally distinct.



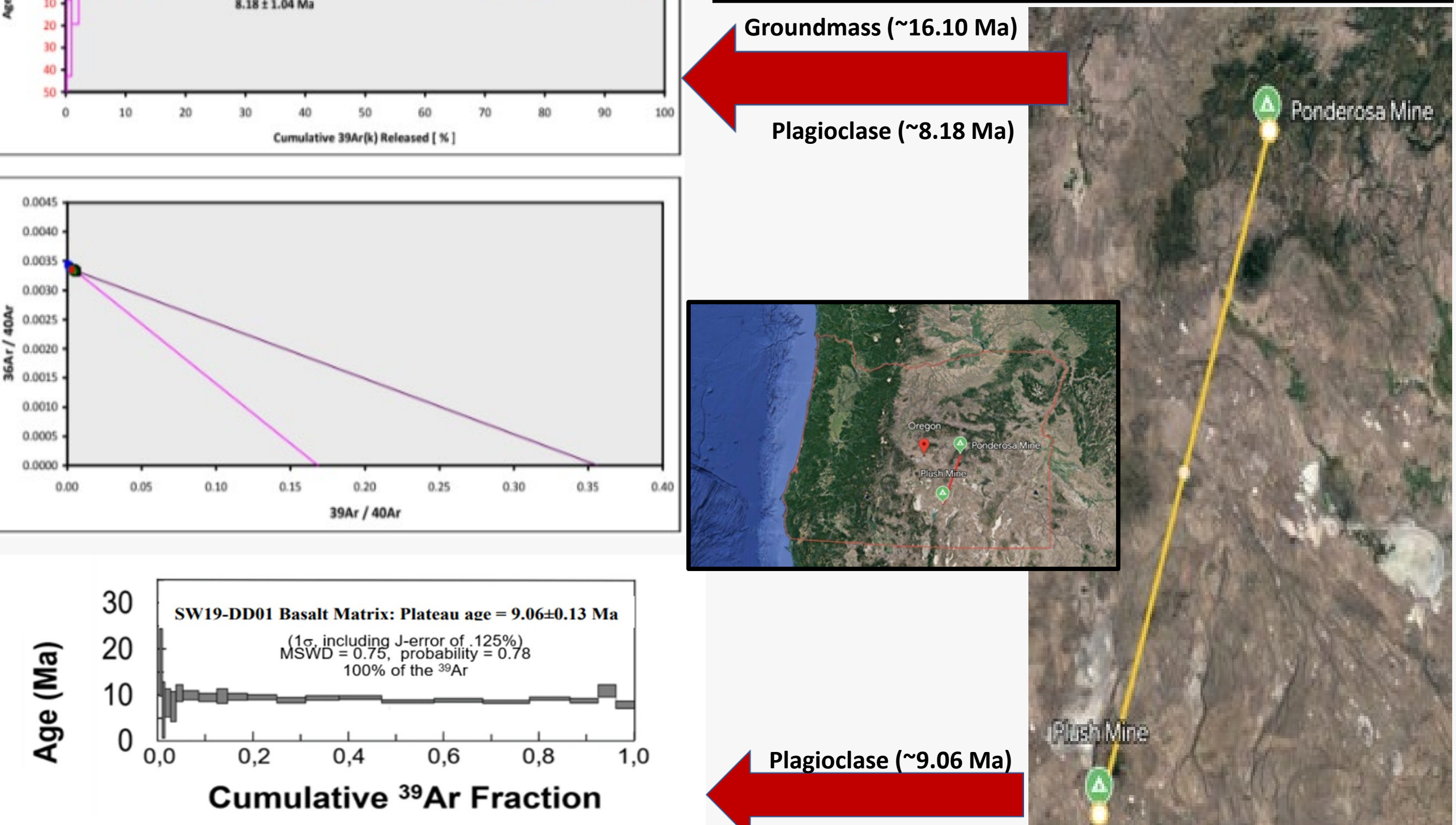
## Fieldwork

- Image A**
- The Ponderosa location of collecting the volcanic bombs and lava flows in Eastern Oregon

- Image B**
- Image of what the sunstones and plagioclase looks like in the lava flows

- Image C**
- The Plush location of collecting the lava flow samples in Eastern Oregon

## Preliminary Ponderosa Incremental Heating Graphs



## Focus Questions:

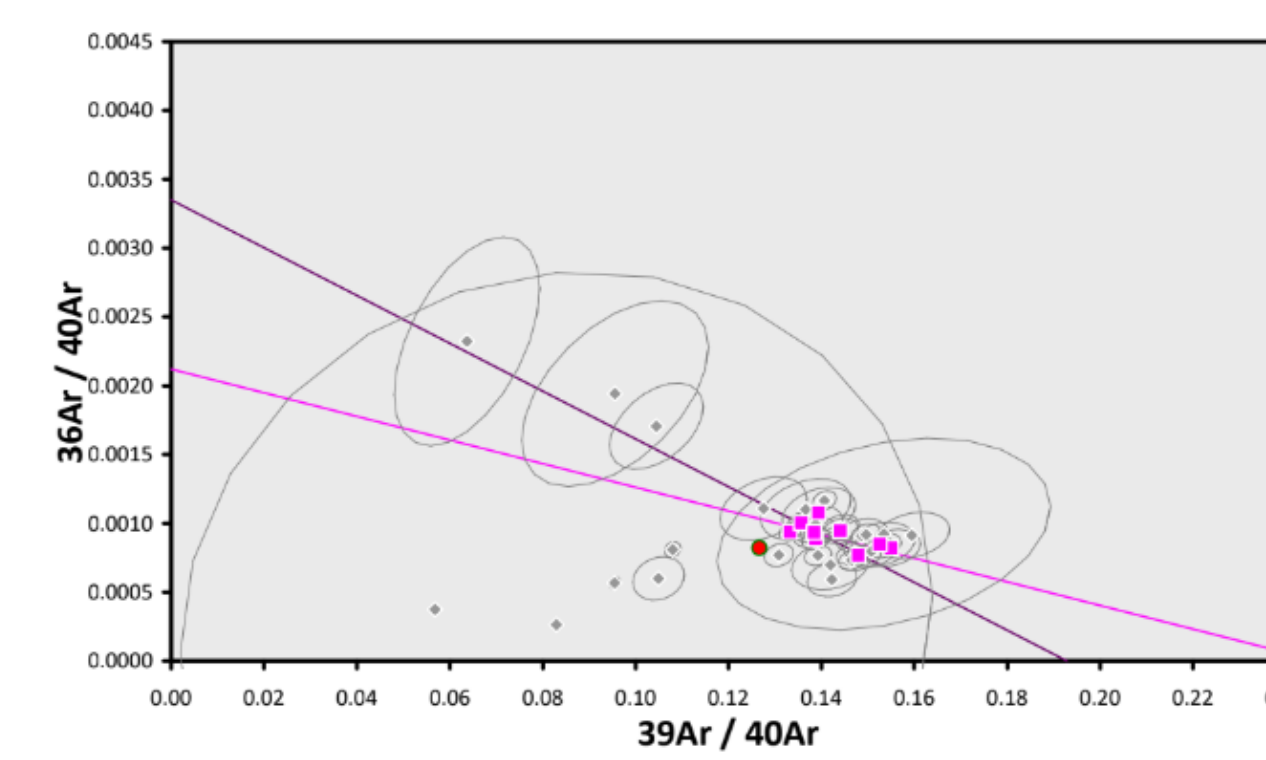
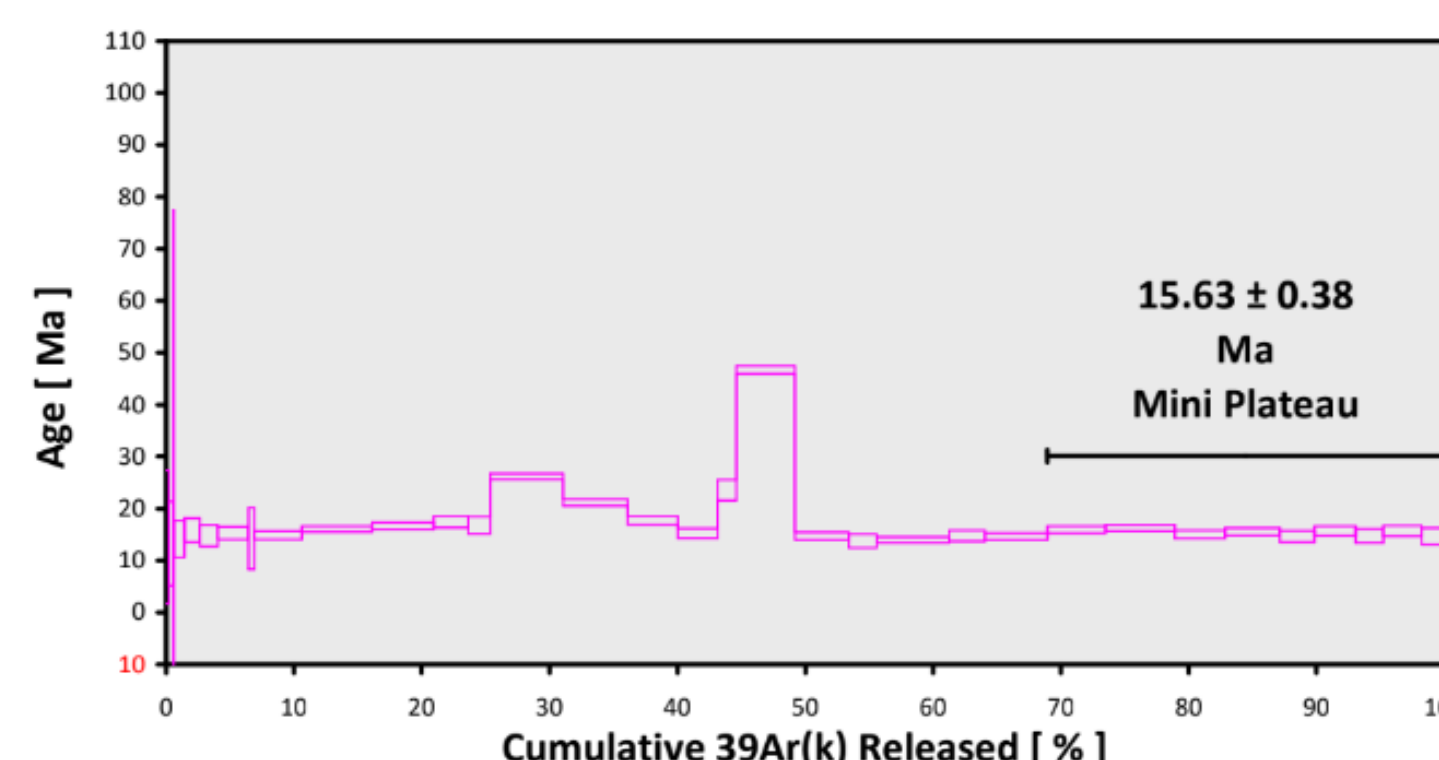
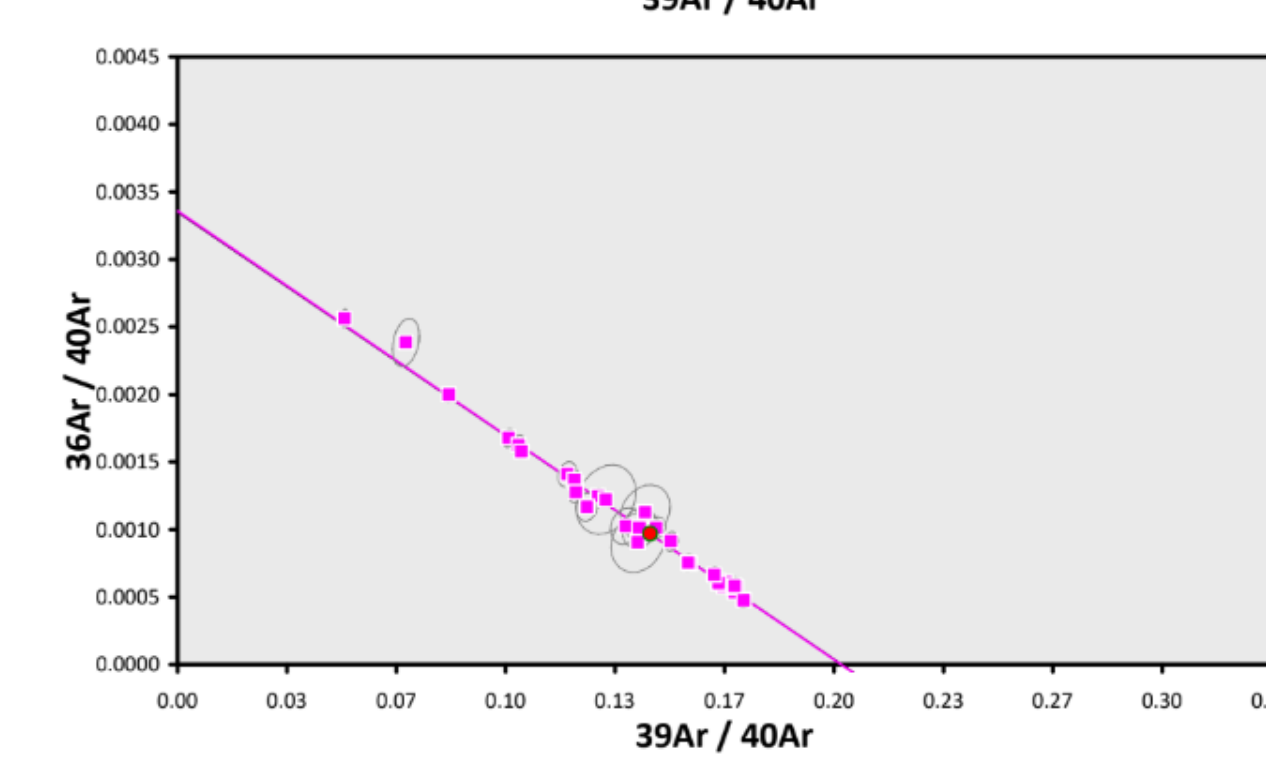
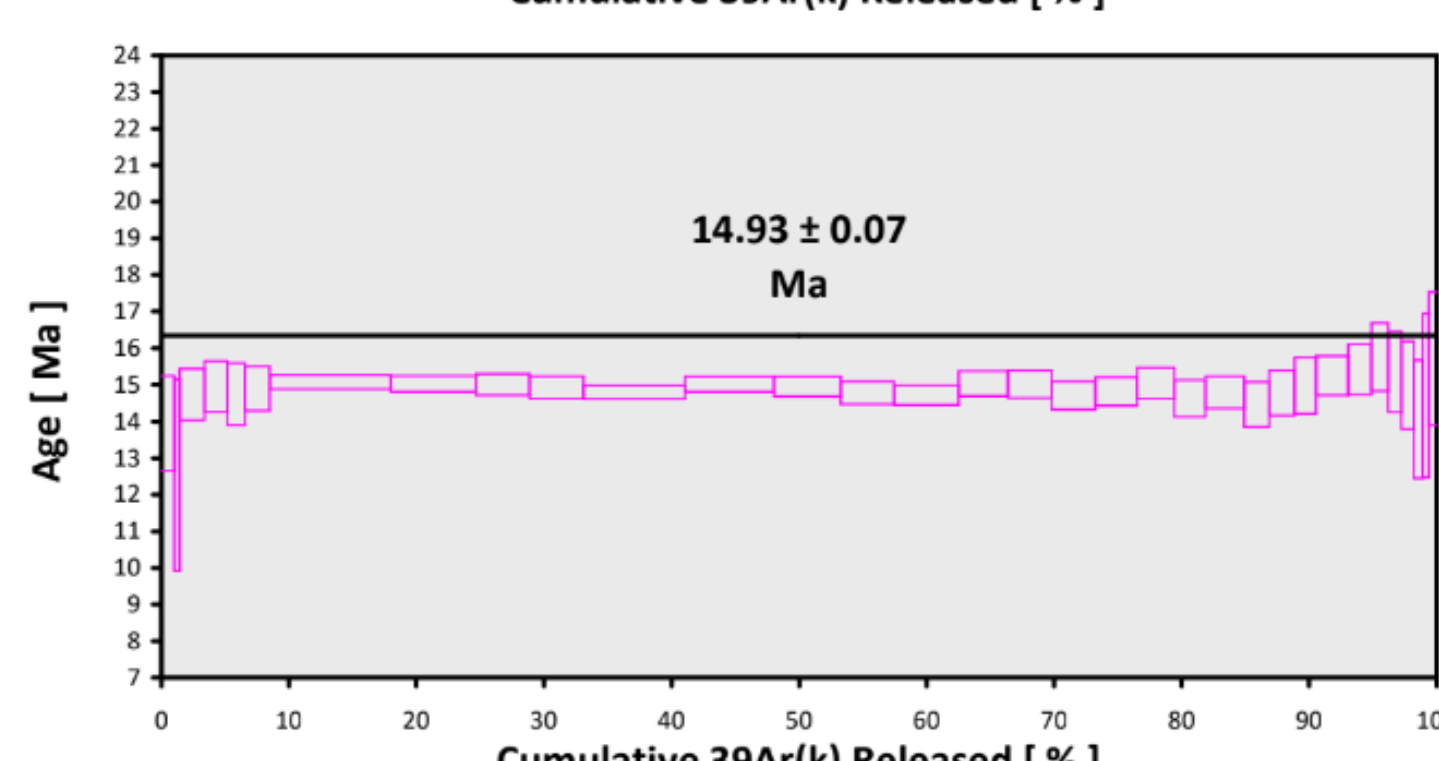
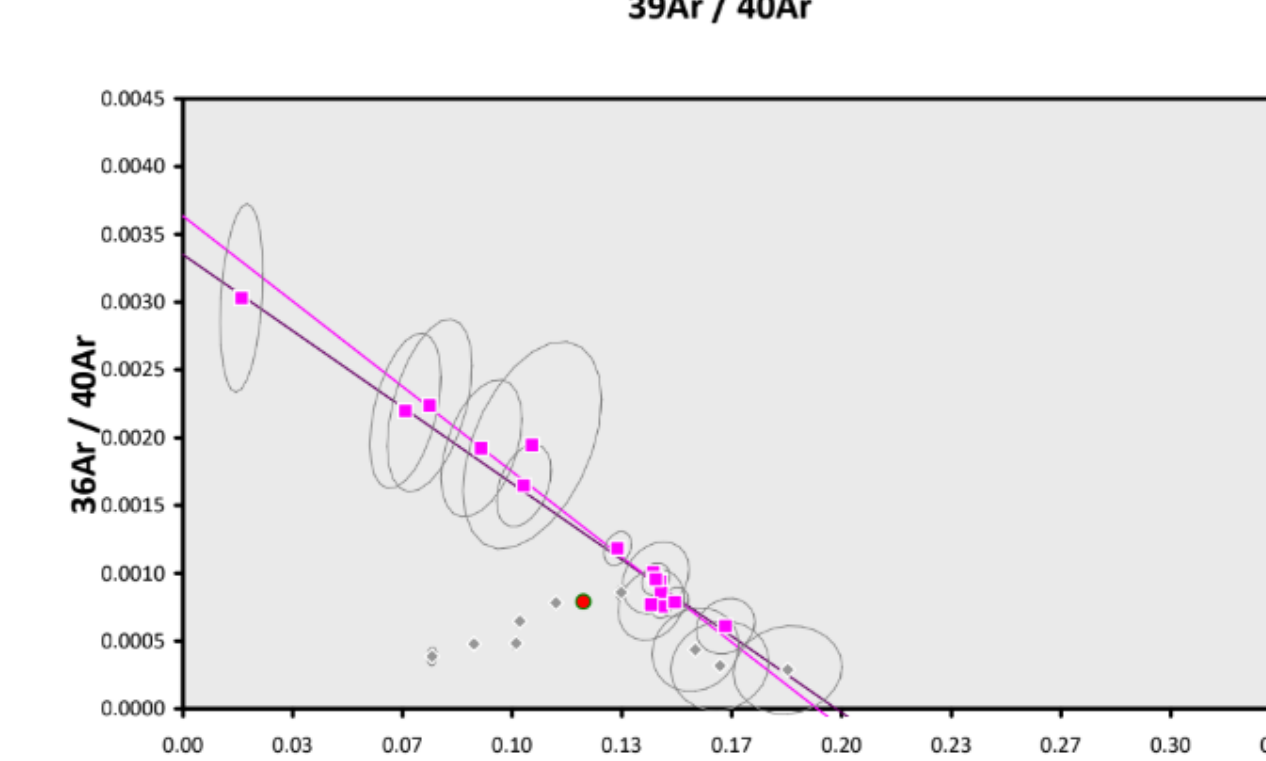
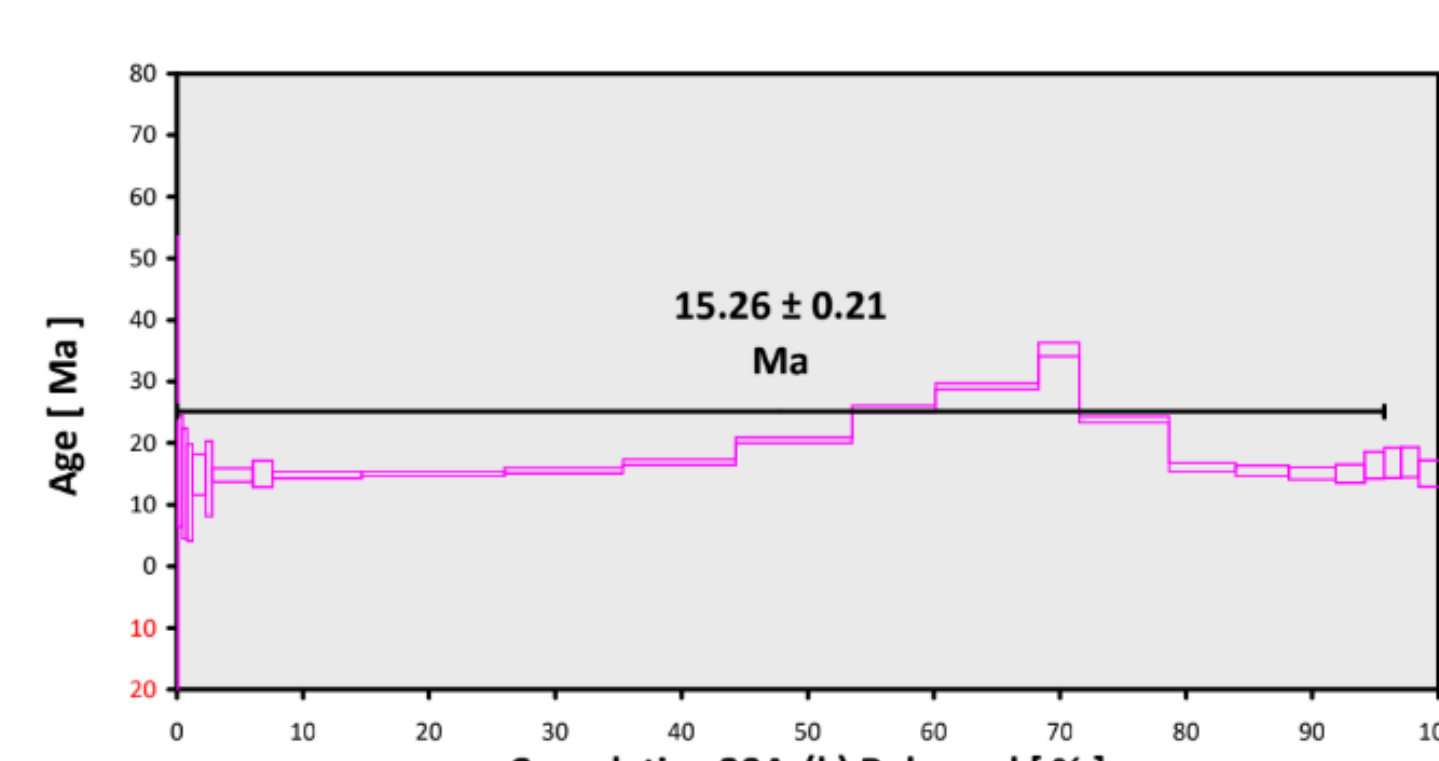
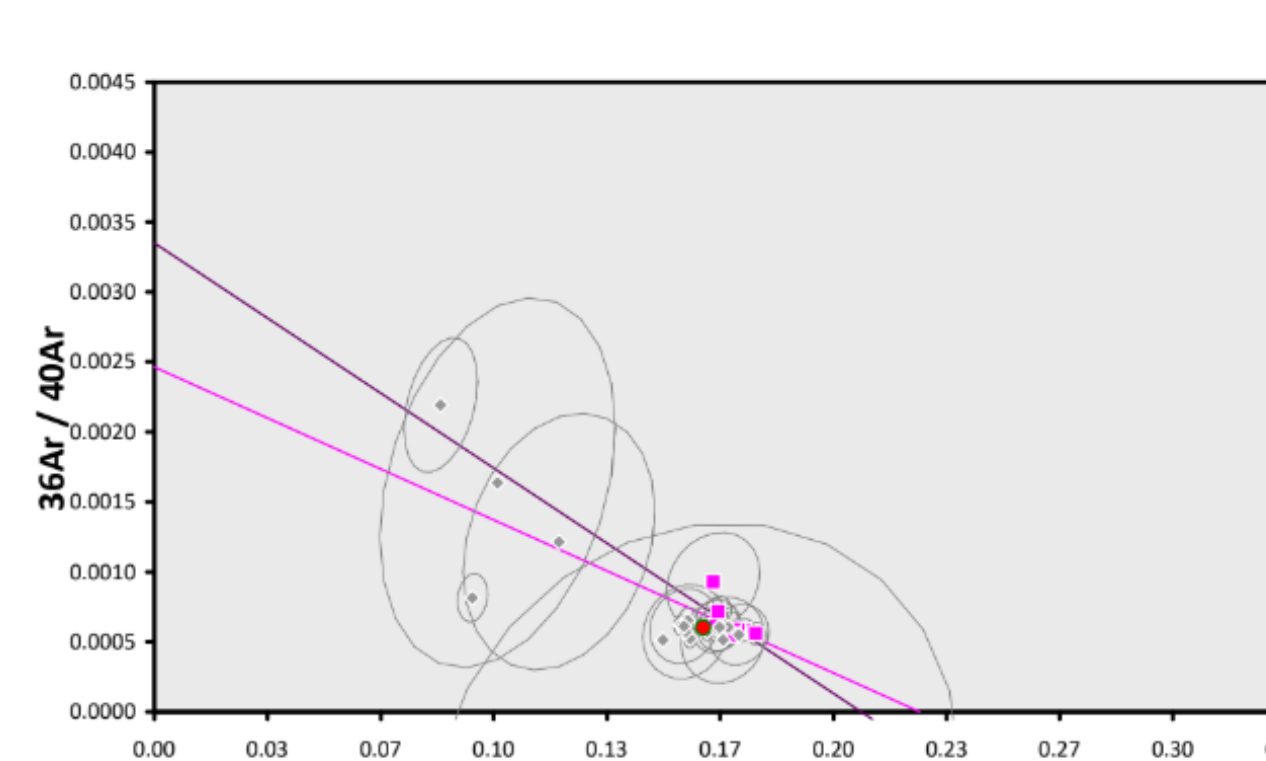
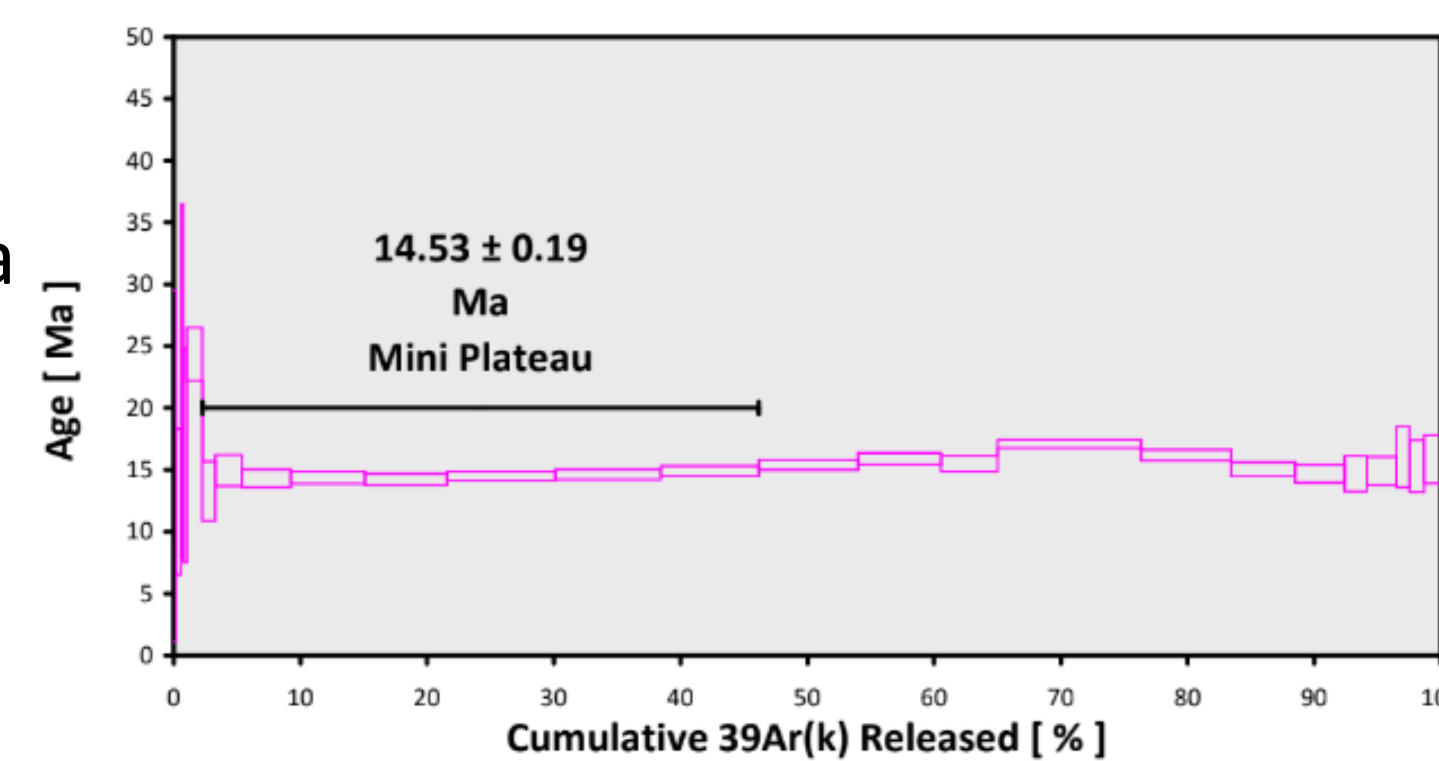
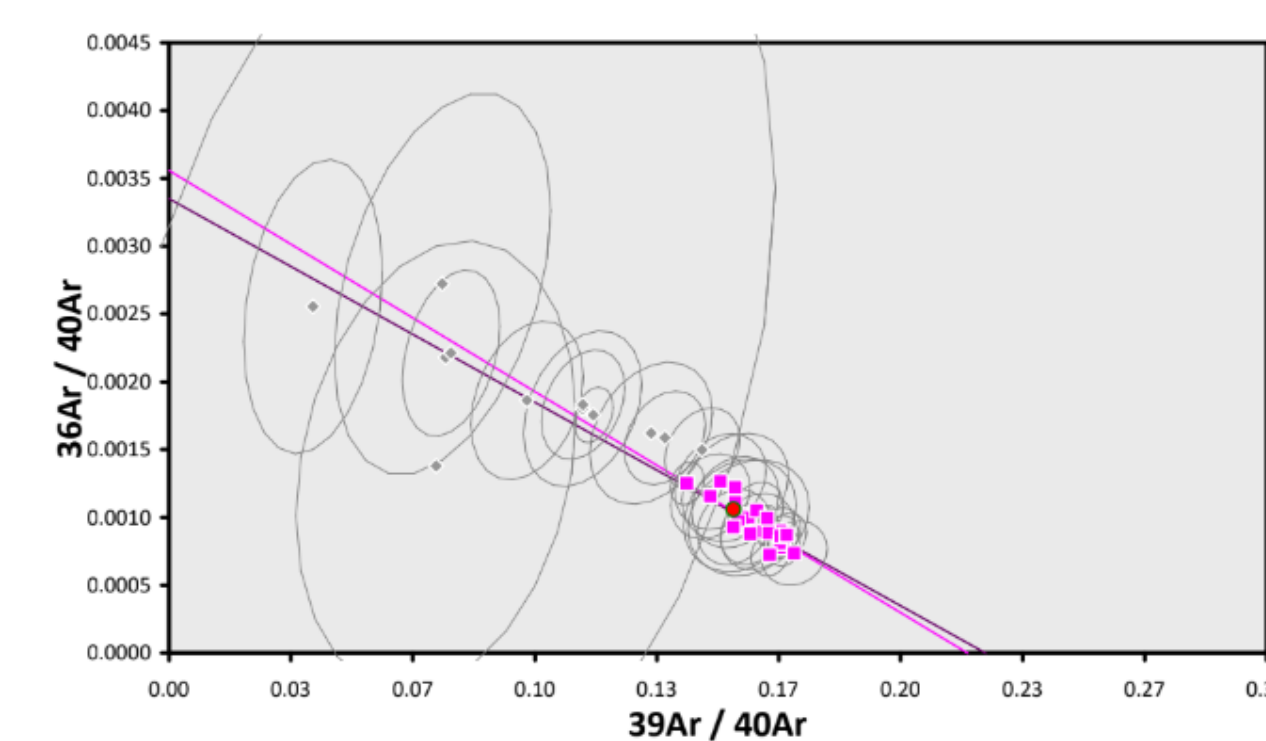
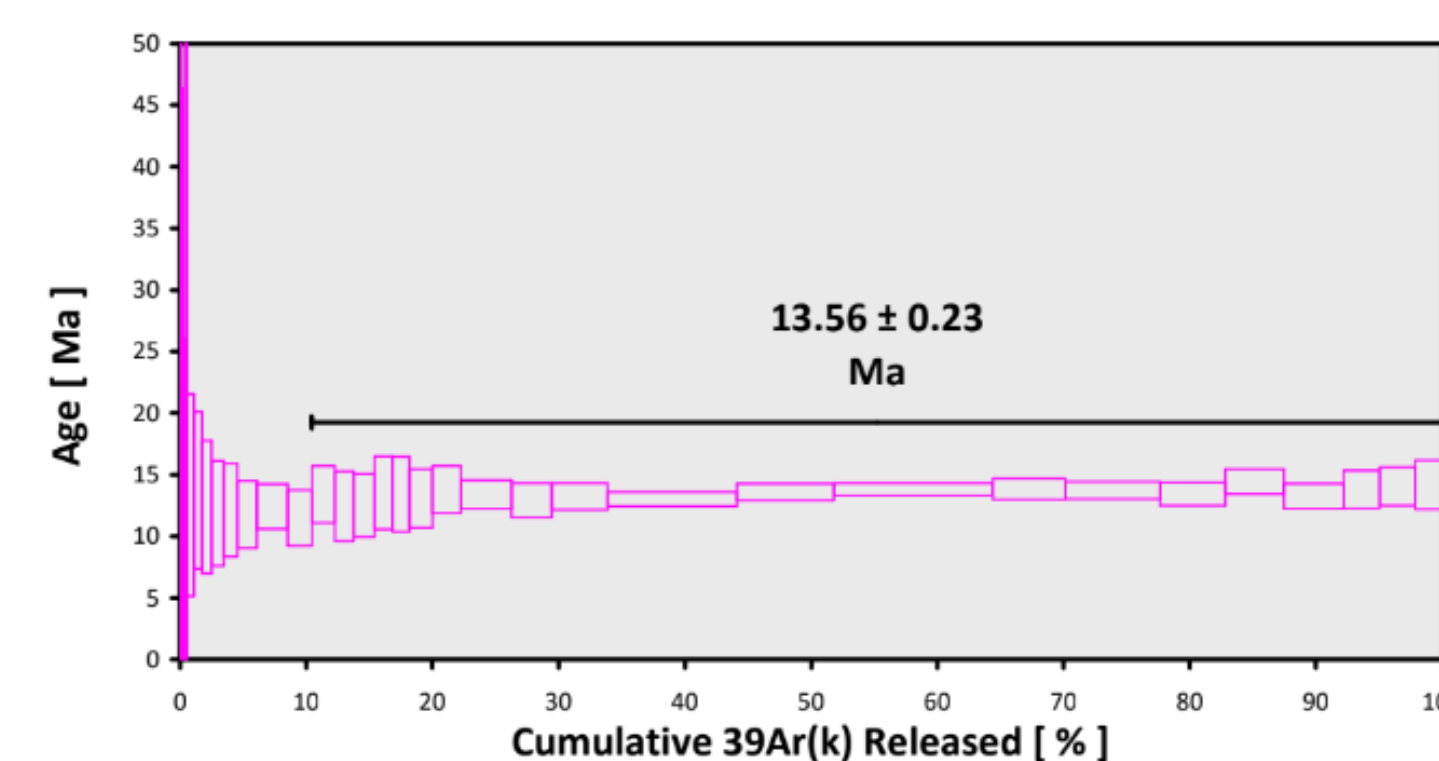
*Do plagioclase <sup>39</sup>Ar/<sup>40</sup>Ar ages from the Ponderosa Mine confirm earlier work that plagioclase is younger than the hosting groundmass (~8-9 Ma)?*

*Do plagioclase ages show influence of a large atmospheric signal (and excess argon)?*

*Do groundmass <sup>39</sup>Ar/<sup>40</sup>Ar ages from the Ponderosa Mine confirm eruptions coeval with the Columbia River Basalt (~16-17 Ma)?*

## New Analytical Plateau and Isochron

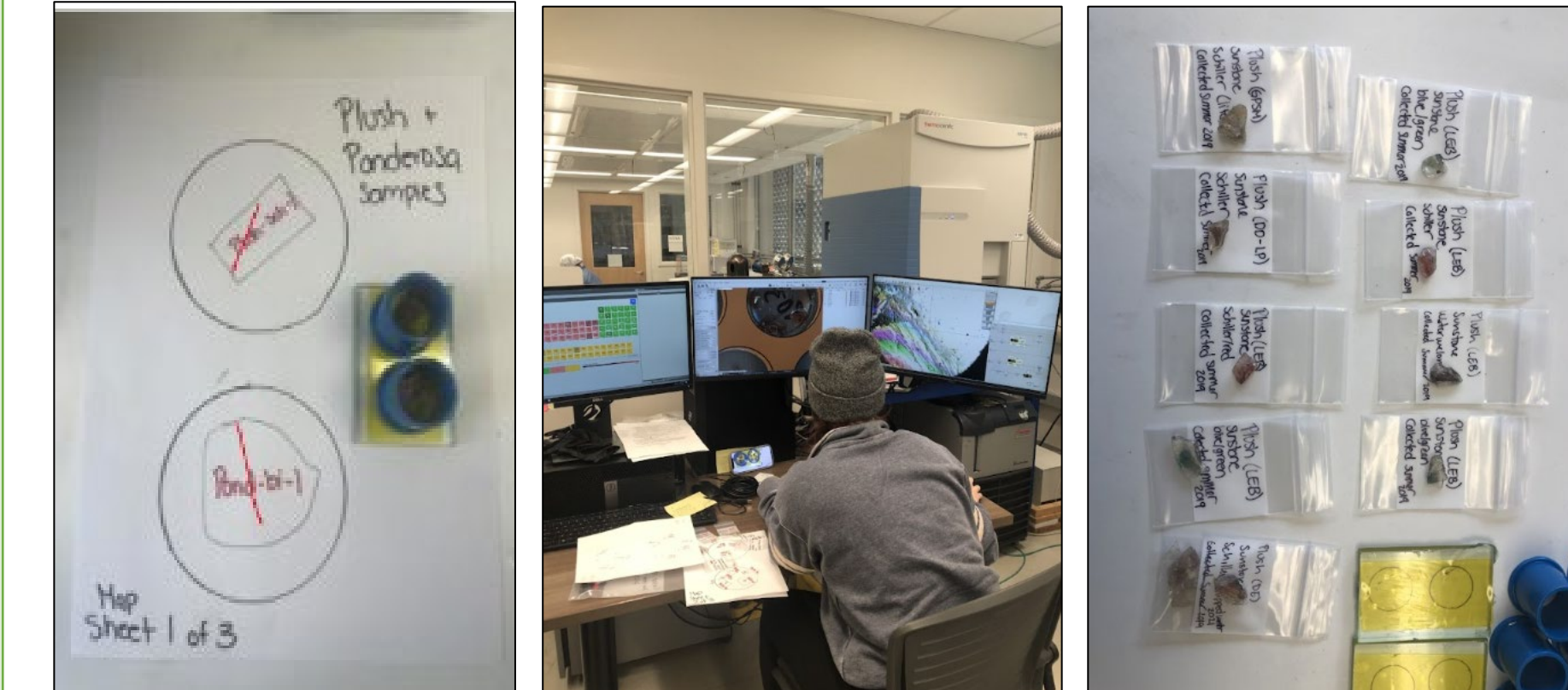
*\*the process uses incremental heating by bulk laser extraction*



## Extended Research:

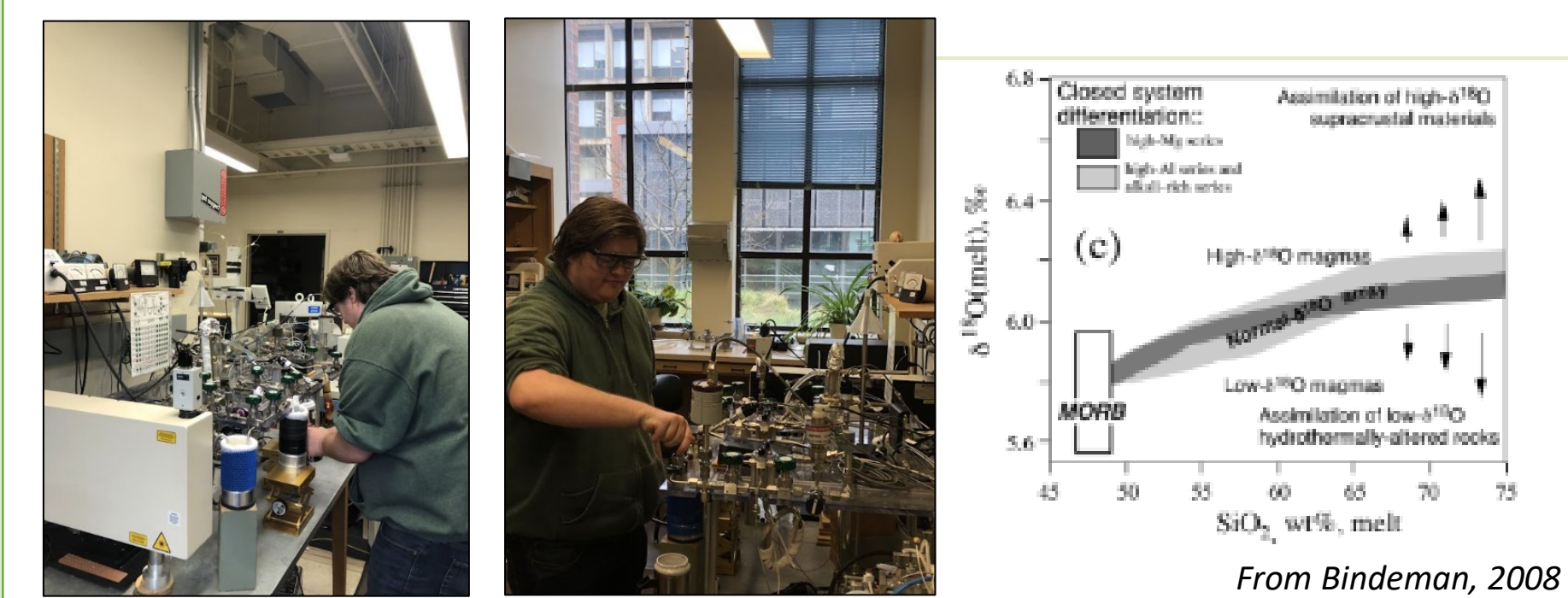
### Laser Ablation Analysis:

Using a pulsed laser to rapidly heat a thin layer of sample that results in the formation of an energetic plasma above the substrate. The resulting element concentration and distribution outline will reveal a systematic contrast between plagioclase and locality.



### Oxygen Isotope Analysis:

Using the isotopic compositions of Delta 18 oxygen within the plagioclase samples to determine the development of the plagioclase. Leading theories of magmatic, hydrothermal processes or a mixture of both lead to age discrepancies.



## Continued Research:

Once ages have been confirmed through argon geochronology, extended geochemical, petrological and volcanology data will need to be acquired to understand relationships between groundmass and plagioclase in eastern Oregon. The additions of computational/numerical modeling can address possible magma chamber development.

- Understanding of age correlation between plagioclase and its hosting basalts
- Fine tuning geochronological Analysis steps to prevent the possibility of human and or mechanical error
- Compare the relationship between Oxygen Isotope Analysis and Laser Ablation to develop a stronger understanding of sample locality magmatic environment.

### Acknowledgment:

- Dr. Emily Cahoon
- Daniel Heaton OSU Argon Laboratory
- Anthony Koppers OSU Argon Laboratory
- Chy Yost Extended Research
- Scott Toney Extended research
- OSU CEOAS
- USGS

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