Lab Description

AGeS Program Laboratory Overview

U.S. Geological Survey Denver Argon Geochronology Laboratory

12/7/2020

The USGS $^{40}Ar/^{39}Ar$ geochronology laboratory is a modern research facility for determining ages of minerals and rocks. The $^{40}Ar/^{39}Ar$ laboratory contributes critical geochronology to individual USGS research projects and to partners in academia and other federal agencies. The facility is located in a newly renovated laboratory space on the Denver Federal Center in Lakewood, Colorado. We specialize in high-precision geochronology of volcanic rocks and minerals, as well as the formation of ore deposits. Depending on the sample, we can analyze potassium-bearing samples as young as the Holocene. The laboratory houses ARGUS VI and HELIX-MC mass spectrometers with fully automated extraction lines and CO_2 lasers.

Expected Time Frame
Students should expect to spend a minimum of 1 week (5 days) visiting our lab for both data collection and data reduction. Lab scientists are available after the visit to finalize data interpretations for publication. Students can expect to analyze 2 samples/day (single crystal or step heating analyses). Mineral separation is not currently available onsite, but laboratory scientists can advise on mineral separation procedures if facilities are available at or near the home institution, or on commercial options.

Typical steps are as follows. Students will gain direct experience with at least steps 4-6.

1. Samples are loaded into irradiation trays
2. Samples are irradiated at nuclear reactor (1-6 months)
3. Samples are loaded into the extraction line
4. Samples are analyzed using automated run procedures
5. Data are reduced
6. Ages are interpreted

Expected Costs
The cost for argon isotope analysis is $1000/sample. This cost applies to both single crystal total fusion and step heating analyses. Mineral separation costs may be additional. Student should budget approximately $1000/week for living expenses while visiting the lab.

Preparation for Visit
The appropriate minerals or rock fragments should be separated from the sample and sent to the laboratory. After samples are irradiated (1-6 months), the student may arrive on the day of instrument time. If student does not have access to mineral separation facilities, they should contact the laboratory to discuss possible solutions. Student researcher must contact lab contact at least 4 months prior to proposed instrument time to plan sample preparation and schedule visit.

Relevant Laboratory Staff
The USGS Argon Geochronology Lab in Denver is staffed by Research Geologists Leah Morgan and Cameron Mercer. Leah Morgan will be primarily responsible for the visiting student

researcher, and will direct training, sample preparation, analysis, data reduction, and data interpretation.

Data Processing and Interpretation
While in the lab the visiting student researcher will learn how to process and reduce all of the data they collect. This includes processing of raw data into isotope ratios and calculation of ages (MassSpec and PyChron software), as well as interpretation of the data. Leah Morgan will be available after the lab visit through email/videoconferencing until the student researcher is satisfied that they understand the results and have produced publication quality data and data interpretations.

Expected Lab Availability
Due to variable irradiation times, student researchers should schedule time in the lab 4-6 months in advance.

Diversity Statement
Laboratory staff are committed to fostering an inclusive and diverse laboratory community. We strive to create an equitable and safe environment for all laboratory users.

Contact
If you are interested in acquiring $^{40}Ar/^{39}Ar$ geochronology data at the USGS Denver Argon Geochronology Lab, contact Leah Morgan; lemorgan@usgs.gov