

EarthScope Student Geochronology Program, Lab Educational Plan
USGS Luminescence Geochronology Lab, Denver, CO

Shannon A. Mahan, Lab Director
Harrison J. Gray, Lab Manager

Lab Description

The USGS Luminescence Geochronology Lab (www.usgs.gov/luminescence) is a modern luminescence dating facility with many capabilities including Quartz Single Aliquot Optically Stimulated Luminescence (OSL), Quartz Single Grain OSL, and feldspar Infrared Stimulated Luminescence (IRSL) including specialized techniques such as post-IR IRSL, thermal transfer OSL, and TL dosimetry. We operate 3 luminescence readers; an automated Risø TL/OSL-DA-15 with a single grain laser attachment for single grain dating plus a pulsed OSL attachment, a newer Risø TL/OSL-DA-20, and a snazzy SUERC portable luminescence reader. Our lab is fully equipped with dark-room sample preparation capabilities along with in-house gamma spectroscopy, neutron activation, and ICP-MS for elemental concentration analyses. We also have portable gamma spectrometry equipment that can be deployed to nearby sites. We have worked on many varied projects for dating sediments involving tectonics, paleoseismology, climate change, archaeology, and paleontology.

Expected Time Frame

Students are expected to coordinate a time frame with the lab director for a one to two week period. During this time the student will learn and perform sample preparation such as sieving, acid treatment, magnetic separation, and heavy liquid density separation. Students will receive one-on-one training from laboratory staff and will obtain a theoretical perspective on luminescence dating and modeling. Training will also include hands-on data and uncertainty analysis and will learn about the measurement of equivalent dose for age determination. Students will leave with a strong grasp of luminescence dating basics and the confidence to include luminescence in their future research.

Expected costs

Sample analysis costs are \$1520 per sample. The cost includes training on how to collect, prepare, and calculate ages, complete sample treatment from submission up to age calculation, and determination of sample dose rate. This cost is the same for any type of luminescence analysis including single aliquot quartz OSL, single grain Quartz OSL, and feldspar IRSL/pIRSL. There is occasionally some flexibility if an additional sample is needed. Students should also budget for the one to two week visit to the laboratory.

Preparation for Visit / Expected Lab Availability/ Data Processing and Interpretation

Students must contact the lab one month in advance to schedule the laboratory visit. Students must bring their complete samples including sample tubes, water content sample, and dose rate sample. Our lab can provide sampling equipment / training if needed. Generally, the lab is very flexible in accommodating students at various times of the year. Students will learn sample preparation techniques and will be instructed on data analysis. Final reports including final age results will be constructed by lab personnel and approved by the lab director. Due to the slow nature of luminescence dating, samples take approximately 9-12 months until the final report is released.

Relevant Laboratory Staff

The USGS Luminescence Geochronology lab is directed by Shannon Mahan (smahan@usgs.gov) and managed by a post doc, Harrison Gray (hgray@usgs.gov). Occasionally, we are staffed by a summer intern from the NAGT/USGS program. All inquiries should be directed to (smahan@usgs.gov). Both Shannon and Harrison will assist with and coordinate sample preparation and training.