

AGeS3 Student Geochronology Research and Training Program Laboratory Overview
Utah State University Luminescence Geochronology Lab

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Lab Description

The USU Luminescence Lab is equipped with two (soon to be three) automated TL/OSL dating systems (Model Risø TL/OSL-DA-20A/B), the latest generation luminescence reader, with a laser-driven single-grain attachment that allows for the dating of individual sand grains. The lab has all the facilities needed for optically and infrared-stimulated luminescence (OSL and IRSL) analysis including a dedicated sample preparation lab under amber safe-light conditions.

The lab has the capability to analyze quartz and feldspar sand using common analysis procedures such as the single-aliquot regenerative-dose (SAR) protocol on both quartz (blue-light stimulated OSL) and feldspar (infrared stimulated luminescence, IRSL) and more specialized techniques such as single-grain dating of quartz.

You are Welcome Here!

The USU Luminescence Lab welcomes all visitors from a diverse range of racial and ethnic backgrounds, LBGTQ+ communities, physical abilities and personal attributes. We value your inclusion in the lab. You will be respected and feel safe to be yourself while at the USU Luminescence Lab and collaborating with the lab staff.

Field sampling

The USU Luminescence Lab [website](#) has many resources to help you plan your fieldwork and sample collection. We can send you sampling supplies to ensure that your samples are collected in the most suitable methods and materials. Please contact Dr. Rittenour to discuss strategies and the most appropriate sediments for sampling.

Expected Time Frame for the lab visit

Students should plan on spending a minimum of 5 full business days at the lab to process their samples, longer if more than 10 samples are processed. Students will be expected to conduct the physical processing of their samples (sieving, splitting, weighing), dissolution in weak acids (10% HCl, bleach, dispersant) and heavy liquid separation (non-toxic sodium polytungstate). Lab staff will treat samples with concentrated HF acid, conduct routine loading of samples after the student leaves, analyze all results and produce final age reports.

The basic steps students will learn and perform at the USU Luminescence Lab include:

- Proper lab protocols for cleanliness, chemical handling and general procedures in the dark lab
- Collection and measurement of water content
- Preparation of samples for dose-rate analysis
- Physical processing of samples to purify quartz and k-feldspar minerals
- Removal of organics, clays and carbonates
- Heavy mineral separation

SHORT COURSE OPTION - Students are recommended to attend the two-week OSL Short Course, offered in late May/early June most years. The USU OSL short course provides students with a solid background on luminescence dating techniques, applications, laboratory processing, field sampling methods, final data analysis, and age and error calculation. The course focuses on the latest optically stimulated luminescence (OSL) dating techniques and the single-aliquot regenerative-dose (SAR) procedure. During the two-week short course students will fully process up to 10-15 samples and bring two of these samples to the point of initial data collection and preliminary age determination.

Costs for OSL Analysis and OSL Short Course

Costs for sample analysis are \$500/sample for small aliquot OSL/IRSL analysis of quartz and feldspar sand and \$1000/sample for single-grain analysis or middle Pleistocene samples (>250 ka); higher costs due to greater instrument and analysis time. These prices are reduced from the standard collaborative rates of \$1050 and \$1550 for small aliquot and single-grain/Middle-Pleistocene analysis (\$550 discount for students processing their own samples). Contact the lab to discuss your project goals and sediment source to determine which method will be required. We can help recommend on and off-campus housing options during your visit. USU can be easily accessed through the Salt Lake City International airport and the SL Express [shuttle](#) system.

Cost for the OSL Short course is \$1550 and includes shared housing during the two-week course. Sample processing fees are separate from the Short Course fee.

Preparation for Visit

Students should have collected their OSL samples, samples for dose-rate and water content and filled out the sample submittal sheets (see <https://www.usu.edu/geo/osl/>) prior to arriving at the lab. Prior to sample collection, students should have discussed the most suitable target sediments in their field area for sampling and have received instruction on sample collection. Appointments for visiting the lab should be made at least 2 months in advance. It is highly recommended that students attend the USU OSL Short Course in late May/early June and should contact the lab regarding interest in this short course 4-6 months in advance, as space fills up fast. Note that OSL analysis is quite time intensive and final results typically are available 9-12 months after samples are brought into the lab.

Data Processing and Interpretation

Visiting students will primarily be in charge of the processing of their samples and purification down to quartz and/or k-spar separates. While students will learn steps involved in data analysis and age calculation during the OSL Short Course, the lab manager and director will conduct all data analysis and age calculations and produce final reports for the students. Preliminary reports and updates on the preliminary age results will be supplied to the student upon request.

Lab Availability

Students with AGES3 awards will be given priority in the registration for the OSL short course and scheduling time to process samples in the lab. Note that the lab follows a standard M-F work week and is not open for visitors weekends. Plan to arrive in Logan on a Sunday and stay until the following Saturday so you can have 5 full working days M-F. Lab visits should be arranged several months in advance to allow coordination with the lab schedule.

Expected Timeframe for Results

Luminescence dating is time intensive due to the large number of analyses needed to calculate an age (typically several dozen aliquots or several hundred grains are measured for each sample) and the need to replicate the radiation dose the sample received during burial, plus the multiple data quality checks on equivalent dose calculated for each aliquot/grain. See [Mahan et al., 2022](#) and [Rhodes et al., 2011](#) for reviews of the method.

For these reasons, students should expect that it could take 9-12 months before OSL/IRSL results are complete. The USU luminescence lab understands that students might need preliminary age estimates before final results are available, and we will work with you to send you preliminary results as they come in.

Relevant Laboratory Staff

The USU Luminescence Lab is directed by Dr. Tammy Rittenour (tammy.rittenour@usu.edu) and managed by Dr. Michael Strange (michael.strange@usu.edu). Laboratory technicians will assist visiting students with sample processing and Dr. Rittenour or other Lab staff will perform the HF- dissolution steps.