

EarthScope Student Geochronology Research and Training Program Laboratory Overview

Desert Research Institute E.L. Cord Luminescence (DRILL)

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The Desert Research Institute E.L. Cord Luminescence Laboratory (DRILL) is fully dedicated to luminescence age dating and research. The DRILL consists of 2 component labs—the DRILL Luminescence Laboratory and the DRILL Dosimetry and Gamma Spectroscopy Laboratory. The DRILL is equipped to conduct current techniques for luminescence sample preparation and analysis for geological, geomorphological, and archeological materials, primarily targeting quartz and/or feldspar.

Preparation and analysis of luminescence samples is conducted in separate rooms with lighting appropriate for luminescence work. The Preparation Lab is equipped with all benchtop equipment (e.g. centrifuge, sieves, balances, drying oven, hoods etc.) necessary to conduct all sample preparations including coarse and fine grained quartz and feldspar separations of sediments or solid objects. Luminescence measurements are made in the OSL Analysis Lab equipped with one multi-aliquot TL and IRSL Daybreak 1150 Reader; one multi- or single-aliquot OSL/IRSL Daybreak 2200 Reader with an embedded irradiation attachment and a beta (Sr-90) source; and two OSL/IRSL DA-20 Risø TL/OSL Readers both equipped with green and IR laser single-grain dating attachments, pulsed-diode and linearly modulated addition capabilities for both blue and IR optical stimulation, and automated beta (Sr-90) and mini X-Ray Varian VF-50JWS (max. 50 kV, 1 mA) irradiation attachments. Irradiation for various purposes, for example for defining α dose rate efficiency for fine grained samples, is provided by supporting equipment including two automated stand-alone evacuable alpha (Am-241) and three beta (Sr-90) irradiators. Environmental dose rates are measured by thick source alpha counting (TSAC) with five operational Daybreak 582 alpha counters for U and Th. As part of a current/continuing MRI award, the DRILL is acquiring a Canberra Broad Energy Germanium Detector BE3830 Gamma Spectroscopy System with equipment necessary for its safe operation including a lead shield, cryostat stand, digital signal analyzer, and software in February, 2017 that will be used to measure gamma dose rate after set-up and calibration. The DRILL also includes a Canberra Inspector 1000 Digital Hand-Held Multichannel Analyzer with NaI probe for making dose rate measurements in the field in situ.

Expected Time Frame

Students should plan for a 2-3 week visit. The visit should be scheduled in advance with the lab director.

The student will receive instruction on collecting samples. After collection, the student will submit samples in advance of the visit for preparation and initial analysis tests by the lab staff. Upon arrival, students will work on preparation of other samples in the lab to gain experience with preparation. The student will not use hydrofluoric acid. Initial tests will be discussed with the student and together, we will create a plan to analyze the samples. The student will then execute the plan and will assist in analysis of the data. The student will also prepare the sample for analysis using the Canberra broad energy Germanium spectroscopy system.

Students will gain the following experience:

Sampling methods

The basic steps students will learn and perform

Good lab practice

Preparation of samples for dose rate measurements

Organics and carbonates removal

Mineral separation

Basic background and theory in luminescence dating

Basic background and theory in environmental dosimetry

Experience using a Riso TL/OSL reader

Experience with luminescence data reduction and analysis

Dose rate measurement using gamma spectroscopy

Evaluating and calculating error in luminescence dating

Age interpretation

Students should budget \$1520 per sample. No additional fee will be included for training.

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