

Optically Stimulated Luminescence Dating of Mono Lake Sediments

A complementary dating method to Surface Exposure Dating

Jörg M. Schäfer, L-DEO schaefer@ldeo.columbia.edu
Sidney R. Hemming, L-DEO and DEES, sidney@ldeo.columbia.edu

1. Abstract

To reconstruct the temporal and spatial structures of past climate changes on our planet precise and reliable dating of the investigated paleoclimatic archive is key. Among the most successful dating methods, applied to terrestrial archives are, besides conventional ^{14}C dating of organic material, Surface Exposure Dating (SED) and Optically Stimulated Luminescence (OSL) Dating of glacial deposits representing advances of continental mountain glaciers. Whereas SED is based on quantifying the period of exposure by analyzing the in-situ cosmogenic nuclides having been produced in the rock's surface since glacial deposition the OSL method is measuring the time elapsed since the samples (mostly rather fine-grained sediments) were last exposed to the surface. Whereas SED is appropriate to date the deposition time of glacial moraines, the OSL method can be used to date the time when a glacial or aeolian sediment was buried in a geological section or a glacial terrace. The two dating methods are therefore of complementary character.

We intend to test the suitability of the OSL dating method as an additional and complementary dating tool for paleoclimate studies at the L-DEO. We will date samples taken from the Wilson Creek Formation, Mono Lake, California. This formation contains layers of drop stones, which might have been deposited by iceberg discharge during the local glaciers reached the level of Mono Lake. In this case, the dropstone layers would represent periods of cold climate conditions. Our initial samples are taken from ash-layers, i.e. aeolian sediments, which offer the maximum reliability for OSL dating. In addition, most of the ash layers are age-controlled by ^{14}C and $^{40}\text{Ar}/^{39}\text{Ar}$ dating.