

Thesis Abstracts

Thesis title : Optical Dating of Selected Late Quaternary Aeolian Sediments From The Southwestern United States
Awarded by : University of Oxford
Author : Stephen Stokes
Date : 1994 **Degree :** Doctor of Philosophy

Abstract

This study combines methodological and applied luminescence research of the quartz optical dating method, using an ion argon laser, with application to Late Quaternary desert sequences of the Southwestern United States. Methodological investigations are undertaken on sample pre-heating, sensitivity changes caused by dating procedures, aliquot normalisation, and dosimetry. These are complemented by investigations of colour filtering of the measured optical emission, sample pre-treatment, and the relationship between quartz petrography and scatter in dating measurements.

Three general types of sensitisation are defined: Type 1 sensitisation which represents sensitivity change during dosing (1A) or pre-heating (1B) which effect trapping efficiency; type 2 sensitisation which represents sensitivity change during pre-heating which effect luminescence emission efficiency; and, type 3 sensitisation which represents sensitivity changes occurring during optical bleaching. Dose dependent sensitivity changes during quartz optical dating are of type 3 and should not affect palaeodoses based on additive dose dating procedures.

Normalisation methods and causes of scatter between aliquots are discussed. A petrographic analysis of a suite of samples exhibiting contrasting OSL behaviour indicates wide ranging genetic forms of quartz, mineral inclusions and quartz overgrowth features which may contribute to growth curve scatter. The significance of a residual α -dosed grain rim is additionally identified as a possible source of scatter. Natural, dose, equal pre-dose and zero glow monitoring forms of normalisation are investigated. Two types of equal pre-dose normalisation methods appear to represent the best alternative to natural normalisation.

The efficiency of signal zeroing is evaluated by an examination of depositional ages for a range of (primarily aeolian) sedimentary environments. A dating intercomparison exercise is

undertaken, comparing optical dating results against numerous alternative dating strategies over a time period ranging from a few hundred, to over one hundred and twenty thousand years. The results suggest good agreement between methods.

A dating investigation is undertaken focusing specifically on the late Quaternary evolution of selected sand seas and other aeolian deposits from the Southwestern United States. These results, in combination with previously published radiocarbon and other chronologies, provide a refined regional picture of late Quaternary aeolian sedimentation and aridity.