

REPORT FOR PERMIT 80/06/01/002/52 OPTICAL DATING SAMPLES FROM PINNACLE POINT, MOSSEL BAY

Sediment samples have been exported for optically stimulated luminescence (OSL) dating analysis to Dr. Geoff Duller based at the University of Aberystwyth, Wales. Here we provide a report on the status, preparation and analysis of these samples.

OSL samples are being studied by both Duller at Aberystwyth and Zenobia Jacobs at Wollongong. The split in the work is determined primarily by samples where the sands are in contact with speleothem. Speleothem can be radiologically hot, and thus can pose special dose rate problems for OSL. The Aberystwyth lab is just now bringing on line a new set of instruments that will be able to read quite precisely these dose rate complications. Since that equipment is just now being brought on line and tested, results are still pending.

Core samples from Pinnacle Point were received in the Aberystwyth luminescence research laboratory. These cores typically consist of flow stone overlying aeolian sands; the sands have been cemented by the carbonates. The samples have been inspected visually by Professor Geoff Duller, Professor Ann Wintle and Dr Helen Roberts in order to assess the most accurate way of dating the cemented sands using luminescence. In order to date the sands using luminescence one has to be able to calculate the radiation dose the samples have received since deposition. One of the major issues for these sands will be the distribution of radionuclides within the samples. The carbonate cementation is typically most intense at the top of the cores, and the proportion of siliciclastic sediments to carbonates appears to increase down core as one moves away from the flow stone. With this variation in carbonate content, it is quite likely that the concentration of K, Th and especially U (and its daughter products) will vary as well.

The first part of the preparation of the samples for luminescence analysis will entail the removal of the carbonates. Following visual inspection of the samples it was decided that it would be prudent to attempt to map the distribution of radionuclides prior to preparation for luminescence measurements since it would be impossible to make such measurements afterwards. Two techniques are available in Aberystwyth that would be suitable for such measurements. The first is an ITRAX core scanner fitted with an XRF system. This uses X-ray diffraction to determine the elemental composition of materials. The second is a laser ablation inductively coupled plasma mass spectrometer (LA-ICP-MS). This uses a finely focused laser beam to ablate material from a solid sample. The ablated material can then be analysed using the ICP-MS to determine its chemical composition.

Of these two techniques, the ITRAX system is preferred since it is non-destructive. However, one area of concern is that the system relies upon an X-ray beam to determine the chemical composition, and this may impart a radiation dose to the sample. Given that luminescence dating measures the radiation dose to which a sample has been exposed

since deposition, using the ITRAX system could potentially compromise all subsequent luminescence measurements. Thus preliminary experiments are now underway to determine the magnitude of the radiation dose which the ITRAX system delivers to samples during measurement, and the depth to which the radiation penetrates. These experiments are nearing completion, and before Easter it should be clear whether the ITRAX system can be used safely, or whether the LA-ICP-MS system needs to be used instead.

Once the distribution of radionuclides has been assessed, the samples will then be ready for removal of the carbonates as the first part of preparation of the luminescence measurements.

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To: "Collette Scheermeyer" <cscheermeyer@sahra.org.za>
Date: 2007/04/20 11:45 AM
Subject: reports
Attachments: Report - Export for Micromorphology 2006-2007.doc; Report - Export for Phytoliths 2006-2007.doc; Report - Export Speleothem Analysis 2006-2007.doc; Report on OSL Export Geoff Duller - 2007.doc

Hi Collette!

Please find attached reports for the following export permits that were issued to Peter:

80/06/02/005/52 - export to Rosa Albert - Phytoliths

80/06/01/010/52 - export to Dr Bar-Matthews - Speleothem Analysis

80/06/01/012/52 - export to Paul Goldberg - Micromorphology

80/06/01/002/52 -export to Geoff Duller - OSL

Should I have missed anything, or you would like me to get these to you as hard copies, please give me call and I will do what I can.

Regards and best wishes,

Kate Collier

C A R M cc

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