

Proposal for Exporting Geological Samples of Limestone for U-Pb Dating in the UK

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Introduction

The fossil hominin sites of South Africa have, until recently, mainly been dated by faunal correlation with well-dated East African Sites. The chronology of the fossil hominin sites in South Africa have fallen short of the well understood chronology of East African due to the limitations in obtaining absolute dates from cave sites. Furthermore, the complexities of the cave deposits, stratigraphic relationships, possible mixed assemblages and taphonomy, to name just a few confounding factors, have hampered a fuller understanding of the hominin sites of southern African. This situation is slowly changing through new techniques in dating (U-Pb, Cosmogenic Nuclides, ESR, Palaeomagnetic dating, etc.

It is obviously of crucial importance to the understanding of both the hominin and non-hominin record in southern Africa to establish a chronology based on absolute dates. Currently, the most widely accepted absolute dating technique is that of U-Pb dating. Recent advances in U-Pb dating of flowstone or fossil enamel have resulted in absolute ages for several of the Sterkfontein valley sites. These include Sterkfontein Member 2, Coopers D, Malapa and Swartkrans.

While a great deal of research in regard to dating sites in the "Cradle" is being undertaken by various researchers, there is still a great deal of work to be done. Further, there are still a number of fossil hominin deposits and sites in the Plio-Pleistocene for which there are no absolute dates, the Drimolen deposit being one of these.

The Drimolen deposit has been dated by faunal correlation at broadly between 2.-1.5 mya. Initial attempts at exploring the concentration of uranium in the limestones from Drimolen were unsuccessful as concentrations were too low for the previous state of technology. Successful uranium-lead dating of Plio-Pleistocene sediments requires high uranium concentrations and low detrital lead contamination. Because uranium and lead isotope concentrations vary significantly between different calcitic layers, it is necessary to characterise the sample prior to analysis. We propose to use laser ablation mass spectrometry for this characterisation. The uranium and lead isotope data will enable us to evaluate whether a precise U-Pb age can be produced from these samples.

Objectives

We request permission to export 15 geological flowstone samples to the UK, see additional attachment. The initial characterisation of the samples via laser ablation will be conducted by Dr. Philip Hopley. Once layers with high uranium concentrations have been located the U-Pb dating will be conducted by Randall Parish of the NERC Isotope Geoscience Laboratory, British Geological Survey, UK.

Materials/Sampling

We ask SAHRA to allow us to courier 15 geological samples of calcite to the UK for dating purposes. Each sample is a small piece of flowstone removed from the larger pieces of flowstone still at the site. There is no breccia adhering to any of the samples. The samples are solely geological. The list of samples and pictures have been attached separately to the SAHRIS site.

Expected Outcomes

The expected outcomes would be an absolute date for the various limestones at the site. In concert with other planned dating techniques such as ESR and Palaeomags an absolute date for the site will be obtained.