

Overview

We are requesting permission to export 13 luminescence dating samples collected from the Middle Stone Age sites of Klipdrift (five samples) and Klasies River (eight samples) for analysis at Royal Holloway University of London, United Kingdom. The aim of this research is to provide radiometric ages for sediment deposition at the Middle Stone Age sites of Klipdrift and Klasies River, using luminescence dating techniques. This analysis will be carried out by Dr Simon Armitage at the Royal Holloway Luminescence Dating Laboratory. Dr Armitage has nearly 20 years of experience in dating African geological and archaeological sediments, and has directed the Royal Holloway laboratory since 2006. Samples were collected under the supervision of Prof. Christopher Henshilwood (Klipdrift) and Prof. Sarah Wurz (Klasies River) from the University of the Witwatersrand.

Sample Details

Klipdrift Complex

Five dating samples have been collected, two from the Klipdrift Cave Lower (KDCL) site, and three from the Klipdrift Shelter (KDS) site. One sample from KDS is a hypothesised hearth stone, and was collected to determine whether this stone was fired in antiquity, using the method of Armitage and King (2013). The remaining four samples from the Klipdrift Complex are opaque plastic tubes containing ~400g of sediment for luminescence measurement, each of which is paired with a smaller (~200g) bag of bulk sediment for geochemical analysis. The latter is required to determine the radioactivity of the bulk sediment, which is a critical component of the luminescence dating process. The KDS sediment samples were collected to determine the age of newly excavated post-Howiesons Poort sediments above those presented in Henshilwood *et al.* (2014). The KDCL samples were collected to determine the age of this undated site, and to determine whether it is a target for future excavation.

Klasies River

Eight dating samples have been collected from within and immediately adjacent to the Howiesons Poort levels of Cave 1a. For each sample, paired opaque plastic tubes each containing ~400g of sediment were collected for luminescence measurement, alongside a single smaller (~200g) bag of bulk sediment for geochemical analysis. Klasies River contains an unusually thick Howiesons Poort sequence, and luminescence dating samples were collected in order to determine the full duration of this industry, and also the timing of key changes within the industry e.g. changes in dominant raw material which occur through the sequence.

List of samples

| Sample name | Sub-samples |
|------------------------------|-------------------|
| Klipdrift Cave Lower | |
| KDCL18#1 | 1 tube, 1 bag |
| KDCL18#2 | 1 tube, 1 bag |
| Klipdrift Shelter | |
| KDS hearth | 1 quartzite block |
| KDS18#1 | 1 tube, 1 bag |
| KDS18#2 | 1 tube, 1 bag |
| Klasies River Cave 1a | |
| KR18#1 | 2 tubes, 1 bag |
| KR18#2 | 2 tubes, 1 bag |
| KR18#3 | 2 tubes, 1 bag |
| KR18#4 | 2 tubes, 1 bag |
| KR18#5 | 2 tubes, 1 bag |
| KR18#6 | 2 tubes, 1 bag |
| KR18#7 | 2 tubes, 1 bag |
| KR18#8 | 2 tubes, 1 bag |

Laboratory analysis

Luminescence measurements will be made on pure sand-sized quartz or feldspar extracted from the bulk sediment extracted from the opaque plastic tubes, while geochemical analysis will be carried out on homogenised (mechanically crushed) material from the corresponding bag of bulk sediment. The material collected in opaque tubes will be wet sieved at $\sim 500 \mu\text{m}$, after which the coarse fraction will be dried and returned to South Africa for sorting within a year of initial receipt at Royal Holloway, thereby minimising the loss of archaeological material. Sand-sized quartz and feldspar will be extracted from the finer ($< 500 \mu\text{m}$) fraction via aggressive chemical treatment, which will result in the destruction of other components of this material. The sediment samples collected for geochemical analysis will first be inspected to ensure that they do not contain important archaeological material, and then crushed prior to measurement. The above procedures will be conducted at the Royal Holloway Luminescence Laboratory:

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References

Armitage, S.J., and King, G.E. (2013) Optically stimulated luminescence dating of hearths from the Fazzan Basin, Libya: A tool for determining the timing and pattern of Holocene occupation of the Sahara. *Quaternary Geochronology*, 15, 88-97.

Henshilwood, C.S., van Niekerk, K.L., Wurz, S., Delagnes, A., Armitage, S.J. Rifkin, R., Douze, K., Keene, P., Haaland, M., and Reynard, J. (2014) Klipdrift Shelter, southern Cape, South Africa: Preliminary report on the Howiesons Poort levels. *Journal of Archaeological Science* 45, 284-303.