

Summary

The Western Mediterranean is a key region to understand human dispersal events within and out of the African continent as well as for the eventual replacement of Neanderthals by anatomically modern humans during the Pleistocene. Palaeolithic cave sites safely store records of hominin presence and lifestyle at a certain time in a certain region and can, furthermore, yield useful information about past environmental conditions. Central to any conclusive interpretation of archaeological and palaeoclimatic datasets is the establishment of a reliable chronostratigraphic framework for the investigated site.

Optically Stimulated Luminescence (OSL) dating provides an estimate of the time elapsed since quartz or feldspar minerals were last exposed to sunlight. The technique, therefore, enables determination of the burial age of sediments at geoscientific and archaeological sites. Single-grain OSL dating is of particular importance in the latter context, as stratigraphical layers at those sites are regularly affected by e.g. post-depositional mixing due to natural or anthropogenic processes, which can result in significant over- or underestimation of the true burial age when using multiple-grain dating approaches.

In this thesis, single-grain OSL dating was used to investigate the general luminescence characteristics of the sedimentary deposits at three Palaeolithic cave sites in the Western Mediterranean - the Thomas Quarries and Rhafas, both Morocco, and Vanguard Cave, Gibraltar - and to identify potential factors that might falsely alter their determined burial ages to eventually provide reliable chronologies for those sites. Dating results were coupled with archaeological, sedimentological and geological proxy data to allow conclusive statements regarding the timing of human occupation phases and the appearance of technological innovations at the sites, local site formation processes and palaeoenvironmental conditions in the region in the past.

Individual grains from all three sites generally exhibit bright and fast component dominated luminescence signals. Challenges for OSL dating of samples primarily arise from i) single grains affected by signal saturation, ii) individual grains unable to recover known laboratory doses with sufficient accuracy, iii) heterogeneous dose rates or changes in dose rates over time, and iv) post-depositional mixing of sediment layers.

Reliable OSL chronologies were developed for stratigraphical sequences at Rhafas and Vanguard Cave, while standard single-grain dating turned out to be an inadequate technique for age determination of the Thomas Quarries sediments. Rhafas covers a time period from >135 ka to the Neolithic, including a technological shift from classical MSA to Aterian after 123 ka, LSA industries dated to ~21 ka and ~15 ka and evidence climatic conditions that favoured intensive carbonate formation during MIS 3 and MIS 2 at the site. Vanguard Cave preserves a record of rapid aeolian sedimentation between MIS 5 and ~43 ka with evidence for repeated occupation by Neanderthals. The sedimentary record of the site suggests that relatively stable mild and sub-humid Mediterranean climatic conditions persisted in the area throughout its entire depositional history.