



Absolute dating of Middle Pleistocene palaeontological records from the Guadix-Baza basin, Spain, using extended-range OSL dating techniques

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The Guadix-Baza basin, southern Spain, contains an important archive of palustrine/lacustrine records covering the late Miocene to Middle Pleistocene. Numerous palaeontological sites have been described within the Guadix-Baza basin, which record faunal and climatic changes spanning the Early to Middle Pleistocene, and contain some of the earliest evidence of human presence in Europe. Chronological control for these palustrine/lacustrine sequences has been achieved via a combination of relative dating methods, such as stratigraphic correlations, palaeomagnetism and biochronology. However, in spite of the large number of research undertaken over the past 20 years, absolute chronological control is still lacking for these sites due to (i) the antiquity of the deposits, which precludes the use of radiocarbon and conventional optically stimulated luminescence (OSL) dating, and (ii) the lack of datable material for long-ranging methods, such as Ar/Ar on tephra or U-series.

Conventional OSL dating of quartz is now routinely applied to sedimentary deposits that are less than 200 ka old, but it is not generally suitable for older deposits owing to saturation of the OSL signal. Over the past 10 years, a series of extended range OSL methodologies have been proposed for dating Middle Pleistocene deposits, which make use of luminescence signals with higher saturation limits. Here we report on chronologies obtained using so-called thermally-transferred (TT) OSL dating and post-IR IRSL feldspar dating of Middle Pleistocene deposits from the Baza sub-basin. In total, 5 samples were collected from deposits bracketing the main palaeontological/archaeological horizons at two sites (Huescar-1 and Cullar de Baza-1). Single-grain OSL was also applied to the youngest samples to obtain additional chronologies for comparison with the multi-grain TT-OSL and post-IR IRSL ages. The suitability of the TT-OSL and post-IR IRSL signals for dating these deposits is tested via a series of quality assurance criteria (signal composition, dose recovery tests, bleaching tests, sensitivity correction assessments). The resultant extended-age OSL chronologies are presented and used to assess (i) the accuracy of existing chronostratigraphic frameworks developed at these sites, and (ii) the wider applicability of these novel dating approaches for constraining early human presence in Europe.