

Evaluating intra- and inter- sample variability in Electron Spin Resonance dating of fossil teeth: an example from Cuesta de la Bajada site (Spain).

Mathieu Duval (1), Rainer Grün (1), Qingfeng Shao (2), Loïc Martin (3), and Lee J. Arnold (4)

(1) Griffith University, Australian Research Centre of Human Evolution (ARCHE), Environmental Futures Research Institute (EFRI), Brisbane, Australia, (2) College of Geography Science, Nanjing Normal University, Nanjing, China, (3) IRAMAT-CRP2A, Université Bordeaux-Montaigne, Pessac (France), (4) School of Physical Sciences, Environment Institute, and Institute for Photonics and Advanced Sensing (IPAS), University of Adelaide, Australia

Over the last decades, technological improvements have progressively enabled to significantly decrease the amount of material required for dating analyses. In particular, the combined use of laser ablation (LA) with ICP-MS opened new possibilities for high resolution in situ U-series analyses of fossil teeth. With this technique it is now possible to directly visualise the spatial distribution of U and Th isotopes in dental tissues. Moreover, the combination of LA-ICP-MS with Electron Spin Resonance (ESR) enables an increased sampling resolution, and offers the possibility to produce several ages for different areas within a given fossil tooth.

To test the potential of this new approach, several fossil teeth were collected from the Middle Palaeolithic site of Cuesta de la Bajada (Teruel, Spain). Each tooth was divided into several subsamples, providing thus several combined US-ESR age results per tooth. For each subsample, ESR, high-resolution laser ablation and solution ICP-MS U-series analyses were systematically performed. Relative beta dose rate contributions from the different tissues and the sediment were also adjusted using DosiVox software and compared with those derived from the standard approach. The results of this work give some interesting insight into the intra- and inter- sample variability that may exist at a given site.

The consistency of the final US-ESR age estimates obtained on teeth are also evaluated by comparison with the (semi)-independent results derived from ESR and Luminescence dating of optically bleached quartz grains collected from the same excavation area.