

Spatial distribution of U, U-series isotopes and CO₂⁻ radicals in tooth enamel

R. Grün^{1*}, M. Duval²

¹*Research School of Earth Sciences, The Australian National University, Canberra ACT 0200, Australia*

²*Centro Nacional de Investigación sobre la Evolución Humana, Paseo de Atapuerca, 09002 Burgos, España*

* *Corresponding author: Rainer.Grun@anu.edu.au*

Uranium has two pathways into tooth enamel. If the outer surface of a tooth is intact, most of the uranium will diffuse into enamel via the dentine. If the outer surface is weathered away, U also diffuses into enamel from the outside. We have learned from a series of detailed spatially resolved U-series analyses on bones and teeth that U-diffusion is a fast process, leading to doubts that continuous U-uptake models have actually any relevance. An earlier study by Joannes-Boyau and Grün [1] showed that the ESR signal that is used for dating is composed of a variety of CO₂⁻-radicals, some of which (the non-orientated species) seem at least partly unstable. These unstable CO₂⁻-radicals occur at much higher concentrations near the dentine-enamel junction compared to the enamel domains close to the surface. These observations suggest that new sampling strategies are required for obtaining potentially reliable ESR dating results. Particularly, screening of the U-distribution seems necessary for making informed decisions which enamel domains are collected for subsequent ESR analysis.

[1] Joannes-Boyau, R., Grün, R., 2011. A comprehensive model for CO₂⁻ radicals in fossil tooth enamel: implications for ESR dating. *Quaternary Geochronology* 6, 82-97.