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U-Th isochron dating of pedogenic impure carbonates: a first attempt of heavy liquor separation

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Pedogenic carbonates and their geochemical composition are pertinent proxies of paleoclimates, paleoenvironments, and past Earth surface processes [1]. But dating pedogenic carbonate remains a challenge due to re-precipitation processes [2]. Radiocarbon dating is limited to 55 ka, making attractive the use of U-Th dating method (up to 500 ka). However, pedogenic carbonates are impure by nature making U-Th dating a methodological and analytical issue. The Total Sample Dissolution technic has been proved to be the only method capable to properly correct for the detrital Th component [3]. An alternative method based on physical separation of detrital and authigenic phases using heavy liquor has been performed successfully on non-consolidated carbonate marine sediments [4]. Nevertheless, no attempt was made on indurated impure carbonates. We tested for the first time the heavy liquor separation on two Holocene pedogenic carbonate nodules from Far North Cameroon, where the geological settings and the processes that have led to their formation are well-constrained [5]; this area is thus ideal to test a new method and to compare it with existing radiocarbon ages.

Pedogenic carbonate nodules include three main components: i) authigenic calcite; ii) granite saprolite; and iii) Saharan dust. The conventional method of isochrones is based on a two end-member mixing (i.e. authigenic phase and detrital phase). This model is no longer applicable in the present case. We attempt to separate the different mineralogical phases by using heavy liquor in order to reduce the system to a two-pole mixture. Results from a first nodule do not provide a plausible age. However, in a second nodule, an isochrone could be applied giving a calculated age quite consistent with radiocarbon data.

[1] Cerling, (1984), *EPSL **71***; [2] Zamanian et al., (2016), *ESR **157***; [3] Bischoff and Fitzpatrick, (1991), *GCA **55***; [4] Henderson et al., (2001), *GCA **65***; [5] Diaz et al., (2016) *EGU **18***.