Improved U-Th dating of carbonates with high initial ^{230}Th using the stratigraphical constrains of coeval and non coeval samples: A Monte Carlo approach

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Speleothems and corals provide a usefull record of the temporal trends of contaminants and tracers [1-2]. This requires an accurate dating, particularly if they must be corelated with other archives. With high precision measurements achieved by MC-ICPMS, the uncertainty on the initial ^{230}Th content becomes a major source of uncertainty for U-Th dating of carbonates. This initial ^{230}Th content is usually calculated with the ^{232}Th content of the sample and its initial ^{230}Th/^{232}Th ratio estimated by:

- an isochron built using coeval samples analyzed on a single stratigraphic level [3] or

- stratigraphical constrains on the initial ^{230}Th/^{232}Th values required to obtain the ages of non-coeval samples in the stratigraphic order along the speleothem (or the coral) [4].

These 2 estimates are based on different hypotheses and have never been coupled. Here, we present a new model called 'STRUTages' based on Monte Carlo simulations. STRUTages combines in a self-consistent maner the stratigraphical constrains from both non-coeval samples (with their ages in the stratigraphic order) and coeval samples (with identical ages within analytical uncertainties). It allows obtaining the best estimate on the initial ^{230}Th/^{232}Th ratio of each sample. STRUTages and isochrones results are compared on a set of speleothems and a coral core. The comparison of the U-Th ages and growth-band counted ages of the coral core demonstrates the validity of the STRUTages approach, whereas some ages derived fom the isochron approach may differ from the counted ages. An Octave (Matlab-compatible) script allowing the use of stratigraphical and coevality constrains will be available.

[1] Pons-Branchu *et al* (2014). *Quat. Geochronol* **24**, 44-53. [2] Lee, J. M. *et al* (2014) Earth Planet. Sci. Lett. **398**, 37-47. [3] Ludwig, K.R., (2003) *Rev. Min. Geochem* **52**, 631–656. [4] Hellstrom, J. (2006). *Quat. Geochronol.* **1**, 289-295.