

***In-situ* carbonate U-Pb analysis by LA-ICP-MS: From absolute dating to understanding the U-Pb partitioning in lacustrine systems**

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The recent and promising application of the U-Pb geochronology to carbonates increased the interest on understanding the driving factors for U-Pb partitioning in carbonates. Indeed, not all carbonates are datable by the U-Pb method, and the dating potential is strictly connected with their U-Pb variability. Here we present the analysis of U and Pb incorporation into carbonate deposits from two paleolakes with well characterized chronostratigraphy and chemostratigraphy: the Nördlinger Ries Crater basin (Miocene, southern Germany) and the Yacoraite Fm. (Cretaceous-Paleogene, Argentina). The Ries Crater and Yacoraite Fm. biogenic and abiotic syn-sedimentary carbonates were deposited in a time window of ca. 2 and 4 My, respectively.

Samples were investigated for U and Pb isotopes by *in-situ* Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS) and ages calculated by $^{238}\text{U}/^{206}\text{Pb}$ and $^{207}\text{Pb}/^{206}\text{Pb}$ isochrons. Dates obtained for micrite, microbial carbonate, ooids and early lacustrine cements are consistent with the sedimentary ages proposed by previous literature, meaning that their pristine U-Pb geochemical compositions are still preserved. Lacustrine abiotic cements are characterized by the lowest U-Pb concentration, low heterogeneity and thus low dating potential. Conversely, micrite and microbial carbonates (fairly precipitated in presence of organic matter or under the influence of biogenic processes) are characterized by an U-Pb inverse proportionality, high U-Pb heterogeneity and high dating potential and are the best candidates to obtain precise and accurate ages.

According to the present dataset, carbonate type and biologic activity seem to be, beside the content and U/Pb ratio of the fluid, the two main factors controlling the carbonate U-Pb partitioning and dating potential.