

Towards reliable LA-ICP-MS U-Pb carbonate dating

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In-situ U-Pb dating of carbonates has been explored previously for various applications, and routine protocols are now established [1]. As primary reference material, WC-1 [2] can be used to correct the measured $^{238}\text{U}/^{206}\text{Pb}$ ratio, while NIST 614 glass is preferred for mass bias correction of the $^{207}\text{Pb}/^{206}\text{Pb}$ ratio. In this work we investigate possible matrix and downhole fractionation effects between carbonate materials, initially thought to be negligible. We demonstrate that these can yield to differences as large as 15% in the final age. Laser parameters have to be chosen carefully to get accurate ages and well characterized, reliable secondary reference materials are essential for these investigations. We used ASH-15D [3] and introduce a calcite vein from northern Switzerland (JT) as new potential reference material. The intercept age of JT was determined both by ID-TIMS (13.797 ± 0.031 Ma) and LA-ICP-MS (13.837 ± 0.135 Ma). While for the correction of the $^{238}\text{U}/^{206}\text{Pb}$ ratio a matrix matched RM is inevitable, our measurements show that for the correction of the $^{207}\text{Pb}/^{206}\text{Pb}$ ratio the chosen reference material is less important. We further document and discuss the effects of varying laser parameters.

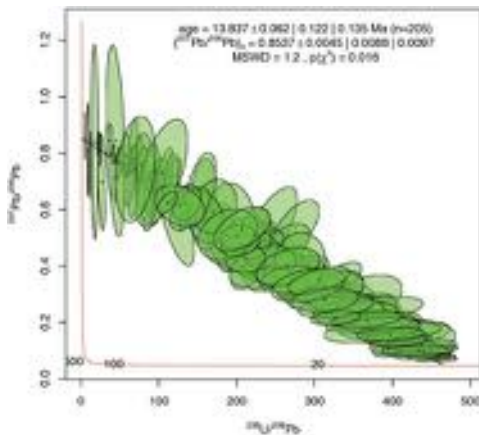


Figure 1: Concordia plot for JT from 5 sessions.

[1] Beaudoin *et al.* (2018), *Geology* **46**, 1015-1018. [2] Roberts *et al.* (2017) *Geochem. Geophys. Geosyst.*, **18**, 2807-2814. [3] Vaks *et al.* (2013) *Earth Planet Sc Lett* **368**, 88-100.