Integrating uncertainty estimation practices in SHRIMP and LA-ICP-MS U-Pb geochronology

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The EARTHTIME initiative has enabled improvements in high-precision ID-TIMS U-Pb geochronology, demonstrating SI-traceable calibrations with rigorous uncertainty estimation. In a similar fashion, the LA-ICP-MS U-Pb community have reassessed their uncertainty estimation and workflow to try to harmonise better practice in quantification and interpretation across the community. The SHRIMP community has a current imperative to rewrite its data handling software providing an opportunity to review ion-microprobe U-Pb workflow and uncertainty estimation methods. This work will provide the perfect platform to integrate SHRIMP U-Pb dating practices with more recent data handling approaches to ensure harmony and comparability of output between SHRIMP, LA-ICP-MS and ID-TIMS methods.

SHRIMP and LA-ICP-MS data acquisition and processing appear to be very similar. Both methods are relative techniques, requiring calibration to matrix-matched primary reference materials analysed under the same conditions at the same time. Measurement uncertainties are similar, calibration requirements are similar and potential system drift has similar effects and impact on data and concomitant uncertainty estimation. For these and other reasons, we are interrogating SHRIMP and recently published LA-ICP-MS U-Pb data handling workflows to compare approaches, learn mutual lessons, and understand the uncertainty propagation requirements of each method such that a complete understanding of the comparability of U-Pb data obtained by the two methods can be ascertained. We will highlight results to date in describing the SHRIMP and LA-ICP-MS U-Pb data handling workflows in tandem allowing data comparison between the two methods to be properly quantified thereby enabling direct quantification and comparison with ID-TIMS reported ages. In this way, U-Pb geochronology will be a more rigorously applied tool from the highest spatial resolution to highest precision, expanding and building on the EARTHTIME initiative to date.