Assessing the long-term reproducibility of high-precision ID-TIMS U-Pb data

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High-precision U-Pb geochronology using chemical abrasion isotope dilution thermal ionization mass spectrometry (CA-ID-TIMS) techniques requires the careful assessment of short- and long-term intralaboratory analytical reproducibility. The accuracy and reproducibility is monitored by repeated analyses of synthetic U-Pb solutions distributed through the EARTHTIME consortium [1], and of well-characterized and homogeneous natural zircon reference materials.

We here report U-Pb isotopic data for two synthetic and six natural reference materials analyzed at the University of Geneva Isotope Laboratory over a period of more than eight years. All analyses were performed employing a Thermo Scientific TRITON TIMS equipped with a MasCom secondary electron multiplier. We document how external variables (SEM changes, measurement strategies, different mass bias corrections linked to EARTHTIME ET535 and ET2535 tracers) influence both short- and long-term reproducibility. Our large high-precision data sets of synthetic reference solutions (2σ = 0.017 to 0.10% uncertainty on single analysis), as well as our data from natural zircon reference materials, display dispersion in excess of analytical uncertainty. This excess dispersion is similar over periods of several days to several years suggesting that the excess scatter results from some unaccounted short-term rather than long-term fluctuations.

We further report new high-precision U-Pb dates for a series of international zircon reference materials (Temora, R33, Plesovice, GJ-1, AusZ2/5) relative to the EARTHTIME tracer solutions ([2],[3]) providing a fully traceable set of reference values that take into account our intralaboratory reproducibility.

[1] Condon, D.J., et al., 2008, *Geochim. Cosmochim. Acta*, **72**, A175; [2] Condon, D.J., et al., *Geochim. Cosmochim. Acta*, in press; [3] McLean N.M., et al., *Geochim. Cosmochim. Acta*, in press.