Intercalibration of two TIMS platforms at the 100ppm precision level for U-Pb geochronology

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We are presenting the results of our efforts to intercalibrate our two thermal ionisation mass spectrometers at Univ. of Geneva, a Thermo Scientific "Triton" purchased in 2005, and a IsotopX "Phoenix" from 2017. Machine setup for these measurements was the following: (i) for Triton: U on 10^{12}Ohm-resistor Faraday collectors, Pb on a MasCom secondary electron multiplier in ion counting mode; ii) for Phoenix: U on 10^{12}Ohm-resistor Faraday collectors, Pb on both a Daly-based ion counting system, as well as on 10^{12}Ohm-resistor Faraday collectors. We monitored precision and reproducibility of both mass spectrometers using ET100 synthetic standard solution and natural reference materials.

Our two machines are intercalibrated at the 100ppm level for $^{206}Pb/^{238}U$ dates within several individual intercalibration test periods. We show slightly increased uncertainties from our Triton, which are due to limitations in the performance of our present 10^{12}Ohm-resistor Faraday collectors. However, our long-term reproducibility is not better than 1000ppm, which is not attributable to mass spectrometry but to chemical effects in the laboratory. One of the identified effects is an apparent U/Pb fractionation in our ^{202}Pb-^{205}Pb-^{233}U-^{235}U Earthtime tracer solution as a function of the residual volume in the bottle. This effect has been identified for different storage conditions for the spike bottle (in an H_2O-saturated environment at ambient temperature, as well as in a refrigerator). We will also present intercalibration results for both mass spectrometers on natural reference materials.

At present, our temporal resolution in U-Pb geochronology is limited by the isotope dilution procedure rather than the mass spectrometers; we need to monitor our laboratory conditions more closely to obtain accuracy at the 100ppm level.