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Reducing analytical time and increasing precision by using 10^{13} ohm resistors for high-precision CA-ID-TIMS U-Pb geochronology on Nu TIMS

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U–Pb geochronology by isotope dilution thermal ionization mass spectrometry (ID-TIMS) is the most precise and most calibrated method for the determination of the crystallization ages of accessory minerals. The small sample size, especially for radiogenic Pb, requires highly sensitive ion detection systems. Most studies employ either secondary electron multipliers (SEM) or Daly photomultipliers providing low noise and high sensitivity but with a limited linear range and requiring dynamic peak-hopping, which consumes analytical time. We evaluate the application of 10^{13} ohm resistors in the Faraday cup amplifier feedback loop for the static collection of all Pb isotopes (sample and tracer) with ^{205,206,207,208}Pb measured on Faraday cups and ^{204}Pb on a SEM with Nu Instruments TIMS. PCIGR Nu TIMS is equipped with 16 Faraday collectors and Zoom Optics enabling perfect peak alignment of Pb and U isotopes at each magnet position. We demonstrate long-term stability of the amplifier gain calibration and reproducibility of amplifier baselines, both short- and long-term. Measured ionization efficiency averages 10mV/pg for Pb isotopes, and 20 mV/ng for U isotopes. Baselines were measured as the average of 900 1.05 s integrations taken before Pb isotopic measurements while heating each sample. Data reduction was performed using Tripoli and U-Pb_Redux software packages. During Pb and U data collection, no further baseline measurements were conducted. Results for reference zircons (Plesovice, FC-1, 91500, AN2) and synthetic solutions (ET100Ma, ET500Ma, ET2000Ma) yield ages within error of published reference values. Additionally, the static Faraday measurements reduce the uncertainty in measured U/Pb ratios by up to 50% compared to peak-hopping measurements, while requiring only 30% of the analytical time. The advantages of the larger linear range of Faraday cups are demonstrated by analyses of Pb*-rich Temora-2 zircons. Our static measurement routine with 10^{13} ohm resistors produces precise, accurate U-Pb results, even for zircons with Pb* <1 pg that yield ion beam intensities of <1 mV for 206Pb and <0.04 mV for 207Pb, respectively. This new technique allows us to push the frontiers of high-precision U-Pb geochronology and may represent a crucial advancement in the quest towards inter- and intra-laboratory reproducibility at the 0.01 % level.