Use of compact discrete dynode (CDD) detectors in a Neptune Plus MC-ICPMS for U-Pb geochronology: comparisons with quadrupole laser ablation data

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U-Pb geochronology on accessory minerals such as zircon is probably the most used microanalytical tool in geosciences, either accomplished by laser ablation or ion microprobe (SIMS or SHRIMP). Laser ablation zircon dating is normally performed coupling a laser ablation system to a single collect ICPMS, either a sector field instrument or a quadrupole. These systems are capable of fast analyses (generally, less than 2 minutes per point) with acceptable precision (2-4% 2-sigma errors for $^{206}Pb/^{238}U$ isotopic system). This is enough to date geological samples up to 5-10 Ma. However, for very young samples, precision and accuracy decrease significantly due to the very low Pb isotope abundances. The same applies for some particular samples in which, albeit older, zircons are very U-poor. The use of an excimer laser system, coupled with a new generation Neptune Plus MC-ICPMS, equipped with 4 compact discrete dynode (CDD) ion counters, used to measure the isotopic abundances of ^{202}Hg, ^{204}Pb, ^{206}Pb, and ^{207}Pb, is presented here together with geochronological applications to Pliocene to Pleistocene samples. The methodology used is a modification of Solari et al. (2010). Tuning employing a NIST 610 glass standard is satisfactory when a signal of ca. 800 mV is reached, together with UO/U oxides < 0.5%. The CDD yields are routinely calibrated between themselves and against a reference Faraday collector at the beginning of each analytical session. Each of them is also calibrated for the right plateau current, generally every couple of weeks. For U-Pb geochronology the standard bracketing method is employed. Because the CDD allow a maximum signal of 1,000,000 cps to be detected, and because of the high instrumental sensitivity (ca. 2 mV/ppm ^{238}U) we generally employ an analytical spot of 17 μm, and 91500 as primary standard zircon. In comparison with the quadrupole, the multicollector allows a better control of the downhole fractionation correction, which is linear instead of exponential or polynomial resulting in a better internal (0.1-0.2% vs. 0.5-0.8% 2SE) and propagated (1-1.5 % vs. 2-3% 2SE) errors, with an overall reduction of the age uncertainties. Although the multicollector requires a larger tuning time, and a more complex CDD calibration, and does not allow the contemporaneous acquisition of zircon trace element contents, its increased sensitivity constitutes an improvement for very young or complex zircons.