Best of both worlds: combining SHRIMP and CA-TIMS methods in refining geochronological determinations for timescale calibration

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The accurate and precise calibration of the geological timescale is a fundamental aspect of geoscience. Recent work focussed on understanding mass extinctions and climate change across the critical Late Permian–Early Triassic boundary in Australia has provided an opportunity to test collaborative approaches to using two commonly used isotopic analytical geochronology methods. Samples — largely assumed to be airfall tuffs — were prepared for in-situ ion probe analysis on a Sensitive High Resolution Ion Microprobe (SHRIMP) in a standard fashion including cathodoluminesence imaging. Images and acquired isotopic data were then used to guide the removal of individual grains from the ion probe mounts for chemical abrasion thermal ionisation mass spectrometry (CA-TIMS). This approach was able to characterise samples relatively rapidly to identify any inherited components thereby providing better targeting and resolution of high-precision ages for timescale calibration. The first-pass SHRIMP ages compare well with CA-TIMS with typically <1% difference, demonstrating that recent instrument developments and new reference materials have further refined the accuracy of SHRIMP analysis. Overall SHRIMP ages in this exercise still tend to be slightly older than corresponding CA-TIMS ages suggesting that any ‘antecrystic’ inheritance in the zircon system, e.g. in the order of a few hundred kiloannum, cannot be easily resolved.