U-TH-PB DATING BY LASER ABLATION - MASS SPECTROMETRY: PANACEA OR PANDORA'S LATEST BOX?

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A new generation of mass spectrometers couples an inductively coupled plasma (ICP) source with a fast, laminated mass analyser and a multicollector detection system. Both liquid and solid samples can be analysed, the latter being introduced into the ICP by laser ablation. The ICP source reaches temperatures of 5000-10000K thus ionising elements of high ionisation energy (e.g. Hf, Os, Th, U) to more than 50%. The laminated mass analyser has fast settling times of ca. 0.2s allowing fast scanning of the mass spectrum. The multicollector system combined with a wide flight tube allow the simultaneous detection of Pb, Th and U isotopes. Preliminary results for glass standards, zircon and monazite from a few laboratories using laser ablation indicate that this type of instrument has the following characteristics: a) it has high sensitivity for Pb isotopes of the order of 5-8E5 cps/ppm; b) yields in run precision comparable with that obtained by traditional thermal ionisation mass spectrometers (TIMS); c) reproducibility is significantly inferior to that obtained by TIMS - 207Pb/206Pb ages vary by about 2%; d) isotopic fractionation is complex: it varies with element, material under analysis, instrumental settings and with the type, characteristics and modes of operation of the laser - shorter wavelength lasers decrease elemental and isotopic fractionation. Both external and internal standards have been used to correct mass bias but none of these methods is entirely satisfactory.