

High precision U-Pb isotopic ages of Permian-Triassic events in eastern Australia: a chronological framework for energy resources

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The Middle Permian-Early Triassic (MP-ET) of Eastern Australia hosts extensive black coal reserves of major economic importance but contains predominantly endemic biota precluding precise international correlation. MP-ET stage boundaries, and end-Guadalupian and end-Permian mass extinction levels are poorly constrained. Attempts to calibrate the MP-ET of Australia using SHRIMP resulted in controversial radioisotopic ages with percent-level uncertainty and compromised accuracy. We here report more than 40 new high-precision (most at the ± 0.05 myr level) using U-Pb CA-IDTIMS single zircon techniques for tuffs in the Sydney, Gunnedah and Bowen basins. These dates provide vital international timescale tie points and allow us to correlate individual tuff beds at the intra and inter basin levels. The youngest dates from the Garie Fm Sydney Basin (c. 247.7 Ma, c. 248.0 Ma) give a late Early Triassic (late Spathian) age. An age of c. 252.2 Ma from the top Bandanna Formation, Bowen Basin equates with the Permian-Triassic boundary. The oldest dates obtained are c. 263.4 Ma from the Broughton Fm and c. 271.4 Ma for the Rowan Fm, Sydney Basin, older than the Guadalupian-Lopingian boundary of c. 260 Ma. Implications of these ages for calibration of stratigraphy, local and regional correlations, placement of mass extinction levels, sedimentation rates, dating of environmental and climate change (including glaciation) and as a chronological framework for energy resources are presented.