Towards an enhanced tephra-based chronostratigraphic framework for the 60 to 30 cal ka period in New Zealand: a contribution to SHAPE

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The NZ-INTIMATE project yielded a generally, but not entirely, well-dated tephrostratigraphic framework from 30 ka (all ages in calibrated years) to the present. As part of SHAPE, we aim to improve the chronology for the New Zealand tephra record for the period 60 to 30 ka, broadly encompassing MOIS 4 and 3. Two widespread marker beds, Rotoehu (45 ka) and Kawakawa (25.4 ka), provide key tie-points for the sequence. Our focus is on rhyolitic tephras derived from the two most active centres in central TVZ, Taupo and Okataina, but documentation of the stratigraphic interfingering of these eruptives with those from Kapenga, Maroa, and Mayor Island (Tuhua) centres is also an objective. The rhyolitic tephra record (60–30 cal ka) comprises Okataina (16 tephras), Kapenga (1), Taupo (7), Maroa (1), and Tuhua (4), with ≥5 tephras pre-dating Rotoehu. Long terrestrial and marine records and maps show that around 10 or 15 of these tephras, mineralogically and geochemically well-defined, provide a coherent stratigraphic framework of widespread markers including Rotoehu (45 ka), Tahuna (39 ka), Maketu/unit-D (37 ka), Hauparu/unit-F (35), Mangaone/unit-I (33 ka), Omataroa/unit-K (32.5), unit-L (31.5 ka), plus two from Tuhua, M3 (40.5 ka) and M4 (37.4 ka). Most tephras are poorly dated, limited to relatively few ^{14}C dates or interpolations from sedimentation rates. Rotoehu tephra has been dated at 45 ka using U-Th-disequilibrium/U-Pb and (U-Th)/He on zircon ('zircon double dating', ZDD), and at 47 ka using Ar/Ar on K-feldspar and biotite. To maximize the potential of the tephras to help achieve SHAPE's goals, we aim to apply ZDD and ^{14}C dating (charcoal), together with Bayesian-based age-modelling of well-dated tephra-bearing sedimentary sequences such as those of Auckland maars, to obtain new dates.