Table SM1: Some key marker tephras in New Zealand erupted since ~3 Ma, their approximate ages, and their stratigraphic, volcanological, or palaeoenvironmental significance.

Tephra	Age (cal ka or Ma)	Stratigraphic significance	References[Φ]
Tarawera	10 June 1886	Plinian-style eruption of scoria from fissure followed by phreatomagmatic eruptions of Rotomahana muddy deposits and climactic pyroclastic surges; biggest and most destructive volcanic event in New Zealand since European arrival; fallout over Bay of Plenty, eastern North Island	Nairn 1979; Walker et al. 1984; Keam 1988, 2016; Lowe et al. 2002; Lorrey and Woolley 2018
Kaharoa	0.6 (AD 1314 ± 12)	Datum for early Polynesian settlement in North Island (settlement c. AD 1280: Wilmshurst et al. 2008) in MOIS 1[*]; most recent rhyolitic eruption in New Zealand	Lowe et al. 1998; Hogg et al. 2003; Lowe and Newnham 2004; Lowe and Pittari 2014
Taupo	1.8 (AD 232 ± 10)	Datum for pre-human-settlement environment in North Island, MOIS 1; the most powerful eruption globally in the last 7000 years, variable pyroclastic eruptives provide world type examples	Wilson and Walker 1985; Hogg et al. 2012, 2019; Lowe et al. 2000, 2013; Lowe and Pittari 2021 ; Barker et al. 2021
Stent (Unit Q TVC[¶])	4.3 ka	Informal boundary of Mid- and Late-Holocene, MOIS 1 (see main article)	Alloway et al. 1994; Walker et al. 2012, 2019; Barrell et al. 2013
Tuhua	7.6 ka	Marks attainment of Holocene relative sea-level high-stand in New Zealand (NZ), MOIS 1; distinctive peralkaline composition	Hogg and McCraw 1983; Lowe et al. 2013, 2018
Mamaku	8.0 ka	Informal boundary of Early- and Mid-Holocene, MOIS 1 (see main article)	Walker et al. 2012, 2019; Barrell et al. 2013; Lowe et al. 2013
Konini Tephra layers N-63 to N-58	12 ka	Andesitic Konini tephra derived from Taranaki volcano (tephra units N-63 to N-58 of Damaschke et al. 2017a) identified in Kaipo bog, and Onepoto and Pukaki maars, marks the Pleistocene-Holocene boundary (11.7 ka) and the start of NZce-1[§] (Holocene interglacial) and MOIS 1. Tephra bed Eg11 (11.9 ka) in Waikato lakes was erroneously correlated with Konini bed b	McGlone and Neall 1994; Alloway et al. 1995; Sandiford et al. 2001; Shane 2005; Walker et al. 2009; Barrell et al. 2013; Lowe et al. 1999, 2013; Damaschke et al. 2017a

Waiohau	14.0 ka	Deposited just before onset of NZce-3, MOIS 2; attainment of sea level -56 m below present	Barrell et al. 2013; Lowe et al. 2008, 2013
Rotorua	15.6 ka	Marks onset of NZce-4, MOIS 2, MOIS 2	Barrell et al. 2013; Lowe et al. 2013
Rerewhakaaitu	17.6 ka	Deposited soon after onset of NZce-5 and also marks Termination I and boundary of Otira Glaciation and Aranui Interglacial, MOIS 2	Newnham et al. 2003; Barrell et al. 2013; Lowe et al. 2013
Okareka	23.5 ka	Deposited just before onset of NZce-6, MOIS 2	Lowe et al. 2008; Barrell et al. 2013; Peti et al. 2021
Kawakawa/Oruanui	25.4 ka	Marks onset of NZce-9, MOIS 2; product of a super-eruption; glass shards identified in central West Antarctica (core WDC06A)	Wilson 2001; Barrell et al. 2013; Vandergoes et al. 2013; Dunbar et al. 2017
Poihipi	28.4 ka	Deposited around onset of NZce-10, late MOIS 3	Barrell et al. 2013; Lowe et al. 2013
Okaia	28.6 ka	Deposited around onset of NZce-10, late MOIS 3	Barrell et al. 2013; Lowe et al. 2013; Peti et al. 2021
Omataroa (Unit K OVC[¶])	30.8 ka	MOIS 3	Smith et al. 2002; Shane et al. 2006; Danišík et al. 2020
Awakeri (Unit J OVC)	31.0 ka	MOIS 3	Smith et al. 2002; Shane et al. 2006; Danišík et al. 2020
Mangaone (Unit I OVC)	31.1 ka	MOIS 3	Smith et al. 2002; Shane et al. 2006; Danišík et al. 2020
Hauparu (Unit F OVC)	35.2 ka	MOIS 3	Smith et al. 2002; Shane et al. 2006; Danišík et al. 2020
Maketu (Unit D OVC)	36.1 ka	MOIS 3	Smith et al. 2002; Shane et al. 2006; Danišík et al. 2020
Tahuna	38.4 ka	MOIS 3	Smith and Shane 2002; Smith et al. 2002; Shane et al. 2006; Danišík et al. 2020

Rotoehu	45 ka	MOIS 3	Wright et al. 1995; Santos et al. 2001; Wilson et al. 2007; Danišík et al. 2012; Flude and Storey 2016
Tephra 13 (Lake Omapere)	74 ka	Marks boundary MOIS 5a and 4	Newnham et al. 2004
Fordell Ash	310 ka	Marks MOIS 9	Bussell and Pillans 1992; Pillans et al. 2005; Pillans 2017
Upper Griffin Rd Tephra	310 ka	Marks MOIS 9	Bussell and Pillans 1992; Pillans et al. 2005; Pillans 2017
Middle Griffin Rd Tephra	340–310 ka	Marks MOIS 9	Pillans et al. 2005; Pillans 1994, 2017
Lower Griffin Rd Tephra	340–310 ka	Marks MOIS 9	Pillans et al. 2005; Pillans 1994, 2017
Kakariki Tephra	340–310 ka	Marks MOIS 9	Pillans 1994, 2017
Rangitawa Tephra H1 tephra (basal unit Hamilton Ash beds; equivalent to lower unit Ohinewai Ash) Whakamaru Ignimbrite	340 ka	Marks late MOIS 10, marks Haweran-Castlecliffian stage boundary; product of a super-eruption	Froggatt et al. 1986; Kohn et al. 1992; Pillans et al. 1996, 2005; Lowe et al. 2001; Carter 2005; Holt et al. 2010; Pillans 2017; Lowe 2019
Onepuhi Tephra Takanini Tephra	0.57 Ma	Marks MOIS 15	Alloway et al. 2004; Pillans et al. 2005 ; Pillans 2017; Rees et al. 2020
Kupe Tephra	0.65 Ma	Marks MOIS 17, deposited not far above Bruhnes-Matuyama boundary	Naish et al. 1998; Pillans et al. 2005; Pillans 2017; Rees et al. 2020
Kaukatea Tephra K15b tephra (Kauroa Ash beds)	0. 90 Ma	Marks MOIS 25	Shane et al. 1996; Naish et al. 1998; Horrocks 2000; Carter 2005; Pillans et al. 2005; Pillans 2017; Rees et al. 2019a, 2020

Waiuku Tephra ?Rocky Hill ignimbite K14bii tephra (Kauroa Ash beds)	0.99 Ma		Horrocks 2000; Alloway et al. 2004; Pittari et al. 2021
Potaka Tephra Kidnappers ignimbrite K14bi tephra (Kauroa Ash beds)	1.01 Ma	Marks MOIS 27, deposited in Jaramillo chron; Kidnappers event was a super-eruption	Naish et al. 1998; Horrocks 2000; Alloway et al. 2005; Carter 2005; Pillans et al. 2005; Cooper et al. 2016; Pillans 2017; Rees et al. 2018, 2019a ; Pittari et al. 2021
Awohau Tephra	1.03 Ma	Marks MOIS 29	Rees et al. 2019a
Rewa Tephra ?Ahuroa Ignimbrite ?Unit D ig	1.19 Ma	Marks MOIS 35	Naish et al. 1998; Alloway et al. 2005; Carter 2005; Pillans et al. 2005; Pillans 2017; Rees et al. 2020; Pittari et al. 2021
Oparau Tephra Ongatiti Ignimbrite K12a tephra (Kauroa Ash beds)	1.30 Ma	Marks MOIS 38-35; product of a super-eruption (see Figs. 14 and 15 in main article)	Pain 1975; Salter 1979; Horrocks 2000; Lowe et al. 2001; Alloway et al. 2004; Cooper and Wilson 2014; Yousef Zadeh 2020; Pittari et al. 2021
Mangapipi Tephra ?Unit B ig	1.51 Ma	Marks MOIS 53	Naish et al. 1998; Pillans et al. 2005; Pillans 2017; Rees et al. 2019b, 2020; Pittari et al. 2021
Ridge Tephra	1.56 Ma	Marks MOIS 53	Pillans et al. 2005; Pillans 2017; Rees et al. 2020
Pahikikura Tephra ?Tiritiri ignimbrite ?Tephra 288 ?Ngaroma Ignimbrite ?Unit A ig	1.58 Ma	Marks MOIS 54/55	Fergusson 1986; Naish et al. 1998; Horrocks 2000; Pillans et al. 2005; Pillans 2017; Rees et al. 2018, 2019b, 2020; Pittari et al. 2021

Birdgrove Tephra	1.60 Ma	Marks MOIS 55	Naish et al. 1998; Pillans et al. 2005; Pillans 2017
Mangahou Tephra	1.63 Ma	Marks MOIS 57	Naish et al. 1998; Pillans et al. 2005; Pillans 2017
Maranoa Tephra	1.63 Ma	Marks MOIS 57	Pillans et al. 2005; Pillans 2017
Ototoka Tephra	1.64 Ma	Marks MOIS 57, marks Castleciffian-Nukumaruan stage boundary	Naish et al. 1998; Carter 2005; Pillans et al. 2005; Pillans 2017 ; Rees et al. 2019b
Table Flat Tephra	1.65 Ma	Marks MOIS 58	Pillans et al. 2005; Pillans 2017; Rees et al. 2020
Vinegar Hill Tephra K3a tephra (Kauroa Ash beds)	1.75 Ma	Marks MOIS 61, deposited just above top of Olduvai chron (see Fig. 14 in main article)	Naish et al. 1998; Horrocks 2000; Lowe et al. 2001; Pillans et al. 2005; Pillans 2017; McLeod et al. 2020; Rees et al. 2020
Waipuru Tephra	1.83 Ma	Marks MOIS 67, deposited within Olduvai chron (near top)	Naish et al. 1998; Pillans et al. 2005; Pillans 2017; Rees et al. 2020
Mangamako Tephra	2.05 Ma	Marks MOIS 77	Naish et al. 1996, 1998; Pillans et al. 2005; Pillans 2017; Rees et al. 2020
Ohingaiti Tephra	2.17 Ma	Marks MOIS 82	Naish et al. 1996, 1998; Pillans et al. 2005; Pillans 2017; Rees et al. 2020
Waiteariki Ignimbrite (TgaVC[γ])	2.10 Ma		Pittari et al. 2021
Papamoa Formation (ignimbrites) (TgaVC)	2.4–1.9 Ma		Pittari et al. 2021
Eagle Hill Tephra	2.85 Ma	Marks Oxygen Isotope Stage G14 (Gauss chron)	Naish et al. 1996, 1998; Carter 2005; Rees et al. 2020
Kowahi Tephra	2.88 Ma	Marks Oxygen Isotope Stage G14 (Gauss chron)	Naish et al. 1996

Siberia Tephra	3.12 Ma		Rees et al. 2020

[*] MOIS, Marine Oxygen Isotope Stage
[¶] TVC, Taupo Volcanic Centre; OVC, Okataina Volcanic Centre
[γ] TgaVC, Tauranga Volcanic Centre (Pittari et al. 2021)
[§] NZce, New Zealand climate event (Barrell et al. 2013)

[Φ] **References in addition to those listed in the main article: Hopkins et al. 2021 "Tephrochronology in Aotearoa New Zealand"** (https://doi.org/10.1080/00288306.2021.1908368)

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Table SM2: Summary of published ages obtained for the coeval Rotoiti Ignimbrite and Rotoehu Ash deposits.

Age (ka)	Error (ka)	Error reported as	Analysis method	Material analysed	Stratigraphic relationship to fall or ignimbrite deposit	Reference number *	Reference
47.4	1.5	1σ	Ar/Ar dating	K-feldspar + biotite crystals	Within Rotoiti ignimbrite	1	Flude and Storey 2016
50	3	1σ	Inverse isochron age	K-feldspar + biotite crystals	Within Rotoiti ignimbrite	1	Flude and Storey 2016
54	3	1σ	Isochron of step heating (upper limit)	K-feldspar + biotite crystals	Within Rotoiti ignimbrite	1	Flude and Storey 2016
58.5	1.1	1sd	Ar/Ar dating	glassy lava	Overlying lava on Tuhua/Mayor Island	2	Wilson et al., 2007
47	3.8	1sd	Isochron ages Ar/Ar dating	biotite crystals	Within Rotoiti ignimbrite	2	Wilson et al., 2007
54.7	4.3	1sd	Isochron ages Ar/Ar dating	biotite crystals	Within Earthquake Flat ignimbrite (EQF)	2	Wilson et al., 2007
61			Amino acid racemisation (AAR)	loess, tephra, and paleosol	Above Rotoehu Ash	3	Kimber et al., 1994
44.0 - 47.4[a]	7	1σ	^{14}C dating	wood	Above Rotoehu Ash	4	Danišík et al., 2012
44.7 - <50.0[a]	2.1	1σ	^{14}C dating	wood	Below Rotoehu Ash	4	Danišík et al., 2012
46.9[b]	+ 1.9/ - 1.6		^{14}C dating not calibrated	lacustrine sediments	Below Rotoehu Ash	16	Newnham et al., 2004
43.2[b]	0.5	1σ	^{14}C dating not calibrated	wood	Below Rotoehu Ash	5	Santos et al., 2001
41.7	3.5		^{14}C dating	wood	Within paleosol below Rotoehu Ash	6	Nairn and Kohn, 1973
44.2	4.3		^{14}C dating	organic rich paleosol	Below Rotoiti ignimbrite (breccia)	7	Grant-Taylor and Rafter, 1971
41			^{14}C dating	wood	-	8	Pullar and Heine, 1971
44.2	4.3		^{14}C dating	organic rich paleosol	-	8	Pullar and Heine, 1971

41.7	3.8		^{14}C dating	organic rich paleosol	-	8	Pullar and Heine, 1971
55-57			River terrace chronologies	Rotoehu tephra on top of raised terrace	Below Rotoehu Ash	9	Berryman et al., 2000
50			stratigraphy and OIS correlation	Rotoehu tephra on top of raised terrace	Below Rotoehu Ash	10	Kennedy, 1994
>40 to <59			Raised marine terrace chronologies	Rotoehu tephra on top of raised terrace	Below Rotoehu Ash	11	Berryman, 1993
52	7		Raised marine terrace chronologies	Rotoehu tephra on top of raised terrace	Below Rotoehu Ash	12	Berryman, 1992
50-55			Comparison of OIS chronology, ^{14}C, stratigraphy	composite	Composite	13	Froggatt and Lowe, 1990
45.2	8.2		Electron spin resonance (ESR)	quartz crystals	Within Rotoiti breccia	14	Buhay et al., 1992
61.1	1.4	1sd	K/Ar dating	glassy lava	bracketing	2	Wilson et al., 2007
64	4	1sd	K/Ar dating	glassy lava	bounding lava flows on Tuhua/Mayor Island	15	Wilson et al., 1992
54	4		Paleomagnetics	Rotoehu tephra core stratigraphy	Rotoehu Ash	16	Newnham et al., 2004
44	3		OSL	organic rich paleosol	Below Rotoehu Ash	17	Lian and Shane 2000
42	8		OSL	organic rich paleosol	Below Rotoehu Ash	17	Lian and Shane 2000
55			Palynostratigraphy	composite	Composite	18	Lowe and Hogg 1995
48.9			Sedimentation rate calculations	lacustrine sediments	Rotoehu Ash	19	Nilsson et al., 2011
49.0	2.45	1sd	Sedimentation rate calculations	lacustrine sediments	Rotoehu Ash	20	Molloy et al., 2008
45.1	1.65	1sd	Sedimentation rate calculations	lacustrine sediments	Rotoehu Ash	24	Peti and Augustinus, 2019

45.1			Sedimentation rate calculations	marine sediments	Rotoehu Ash	21	Allan et al., 2008
45.7	1.9	1sd	Sedimentation rate calculations	marine sediments	Rotoehu Ash	22	Shane et al., 2006
44.3			Sedimentation rate calculations	lacustrine sediments	Rotoehu Ash	23	Shane and Sandiford., 2003
55			Sedimentation rates	marine sediments	Rotoehu Ash	26	Pillans and Wright, 1992
42.2 - 44.8			Sedimentation rate calculations	lacustrine sediments (composite)	Rotoehu Ash	25	Hayward and Hopkins, 2019
45.1	3.3	2σ	$^{238}U/^{230}Th$ disequilibrium, (U-Th)/He	zircon crystals	Within Rotoiti and EQF deposits	4	Danišík et al., 2012
45.1	2.9	2σ	$^{238}U/^{230}Th$ disequilibrium, (U-Th)/He	zircon crystals	Within Rotoiti and EQF deposits	4	Danišík et al., 2012
69	3	2σ	$^{238}U/^{230}Th$ disequilibrium on TIMS	zircons crystals (<63 μm)	Within Rotoiti pumice	27	Charlier et al., 2003
76	6	2σ	$^{238}U/^{230}Th$ disequilibrium on TIMS	zircons crystals (<125–250 μm)	Within Rotoiti pumice	27	Charlier et al., 2003
71	2	2σ	$^{238}U/^{230}Th$ disequilibrium on TIMS	composite (weighted mean of all sizes)	Within Rotoiti pumice	27	Charlier et al., 2003
57	8	2σ	$^{238}U/^{230}Th$ disequilibrium on TIMS	glass-bearing granitoid	Within Rotoiti	27	Charlier et al., 2003
45-50			Stratigraphy coupled with OSL and U/Th (on bounding sediments)	lacustrine sediments	Bounding sediments of Rotoehu Ash	28	Schulmeister et al., 2001
50->350	24	1σ	SIMS model ages	zircon crystals	Within Rotoiti pumice	27	Charlier et al., 2003
60-90		1σ	SIMS model ages	glass-bearing granitoid	Within Rotoiti	27	Charlier et al., 2003

*See Fig. 11B in main article: Hopkins et al. “Tephrochronology in Aotearoa New Zealand” (https://doi.org/10.1080/00288306.2021.1908368)