Table DR-1: Data repository for Valley et al., 2002 containing oxygen isotope ratios and U-Pb ages of zircons from Archean igneous rocks.

Terrane	Sample Number	Age (Ma)	δ18O (Zircon)	Location	Lithology	Reference*
Barberton	B87-5	3538	5.24	Theespruit Tonalite gneiss	Granitic	Valley et al., 2000; King, 2001
	B87-24	3509	4.38	Steynsdorp pluton	Granitic	Valley et al., 2000; King, 2001
	B87-1	3460	5.52	Stolzburg pluton	Granitic	Valley et al., 2000; King, 2001
	B87-4	3443	4.68	Theespruit pluton	Granitic	Valley et al., 2000; King, 2001
	B87-14	3227	5.94	Kaap Valley tonalite	Tonalite	Valley et al., 2000; King, 2001
	B87-32	3228	5.95	Kaap Valley tonalite	Tonalite	Valley et al., 2000; King, 2001
	B87-22	3216	4.91	Dalmein pluton	Granitic	Valley et al., 2000; King, 2001
	B87-18	3304	5.52	Nelspruit tonalite xenolith	Tonalite	Valley et al., 2000; King, 2001
	B87-25	3107	6.00	Mpuluzi batholith	Granitic	Valley et al., 2000; King, 2001
	B87-20	3107	6.55	Boesmanskop pluton	Granitic	Valley et al., 2000; King, 2001
	B87-16	2740	6.12	Mpageni pluton	Granitic	Valley et al., 2000; King, 2001
Slave Province	Anialik 577	2694	4.96	Anialik River igneous complex	Granitic	King, 2001
	Anialik Diorite	2683	5.18	Anialik River igneous complex	Diorite	King, 2001
	Arcadia Veins	2670	4.87	Anialik River igneous complex	Felsic veins	King, 2001
	Anialik 28	2694	4.46	Anialik River igneous complex	Granitic	King, 2001
	Anialik Tonalite	2694	4.86	Anialik River igneous complex	Tonalite	King, 2001
Superior Province volcanics	DD78-24	2729	5.48	Dash Lake	Dacite (2)	King, 1997
	JH 82-3	2736	5.09	Sturgeon Lake cycle 2	Rhyolite (3)	King, 1997
	JH 82-4	2735	5.46	Sturgeon Lake cycle 2	NBU rhyolite (3)	King, 1997
	JH 82-1	2734	5.39	Sturgeon Lake cycle 3	Lyon Lake rhyolite (3)	King, 1997
	JH 82-2	2735	5.33	Sturgeon Lake cycle 3	Lyon Lake rhyolite (3)	King, 1997
	PN 76-15	2734	5.48	Sturgeon Lake cycle 1	Mattabi rhyolite (3)	King, 1997
	PN 76-14	2736	5.51	Sturgeon Lake cycle 3	Lyon Lake rhyolite (3)	King, 1997
	PN 76-13	2717	5.87	Sturgeon lake cycle 4	Felsic pyroclastic (3)	King, 1997
	DD86-17	2700	5.22	Mulcahy	Rhyodacite	King, 1997
	DD83-2	2700	5.73	Chuck Lake		King, 1997
	DD83-5	2700	5.70	Esox Lake	Porphyry	King, 1997
	DD96-1	2700	5.77	93°50'30"W 49°11'N	Lower Kakagi Tuff	King, 1997
	DD95-20	2700	6.80	Separation Lake	Porphyry	King, 1997
	DD78-28	2700	5.47	Berry Creek complex	Quartz porphyry	King, 1997
	DD78-32	2700	6.18	Handy Lake volcanics	Dacitic crystal tuff	King, 1997
	DD78-35	2700	5.42	central volcanic belt	Quartz porphyritic tuffaceous unit	King, 1997
	DD78-43	2700	4.86	Contact Bay, Wabigoon Lake	Rhyolite	King, 1997

	DD81-13	2700	5.08	Keewatin volcanics	Quartz porphyritic rhyolite	King, 1997
	DD82-1	2700	6.07	Oxford lake group	High-K porphyritic dacite	King, 1997
	DD84-2	2700	5.93	north of Sturgeon Lake	Quartz lapilli tuff	King, 1997
	DD84-8	2700	5.49	lower cycle in Lumby Lake	Sheared quartz-phyric rhyolite	King, 1997
	DD84-9	2700	5.18	lower cycle in Lumby Lake	Blue qtz-phyric dacite	King, 1997
	DD85-9	2700	6.51	Big Cameron Island	Shoal Lake dacite fragments	King, 1997
	DD86-4	2700	5.52		Quartz phyric felsic volcanic	King, 1997
	DD86-6	2700	6.68	Commissioner's Bay area	Highly strained felsic volcanic	King, 1997
	DD86-7	2700	5.50	Calm Lake	Quartz-feldspar phyric clast	King, 1997
	DD90-42	2700	6.10	Zigzag Island group	Quartz phyric debris flow	King, 1997
	DD90-60	2700	6.40	Handy Lake	Quartz-feldspar porphyry	King, 1997
	DD93-11	2700	5.10	Gen. L.	Volcanic breccia	King, 1997
	#52	2700	5.64	Power Bay, McInnis Lake	Quartz feldspar phyric crystal tuff	King, 1997
	#60	2700	5.69	McInnis Lake	Quartz-feldspar phyric felsic tuff	King, 1997
	#80	2700	5.23	Tuff in MMV	Quartz phyric felsic tuff	King, 1997
	KN 76-7	2691	5.33		Paymaster Porphyry	King, 1997
	84 SM-7	2714	4.70	Stoughton-Roquemaure Group	Flow-banded rhyolite	King, 1997
	C-88-17	2725	5.07	upper Deloro Formation	Rhyolite	King, 1997
	PN-77-9	2705	6.06	Larder Lake Group	Felsic pyroclastic rock	King, 1997
	C-88-8	2701	5.00	Kinojevis Group	Rhyolite	King, 1997
	PN-77-18	2727	5.58	upper Deloro Formation	Dacitic Crystal Tuff	King, 1997
	PN77-22	2711	5.26	Kidd Creek	Rhyolite	King et al., 1997
	KC 102a	2711	5.91	Kidd Creek	Rhyolite	King et al., 1997
	KCFC-1	2711	5.53	Kidd Creek	Rhyolite	King et al., 1997
	KC465b	2711	5.16	Kidd Creek	Rhyolite	King et al., 1997
Superior Province plutonics	DD87-48	2730	5.69	Atikwa	Trondhjemite	King et al., 1998
	DD84-20	2730	5.97	Atikwa	Snowflake dike	King et al., 1998
	DD83-9	2733	5.24	Atikwa	Granodiorite	King et al., 1998
	DD83-4	2732	4.96	Atikwa	Granodiorite	King et al., 1998
	DD83-10	2732	5.54	Atikwa	Quartz diorite	King et al., 1998
	DD81-32	2734	5.52	Atikwa	Quartz diorite	King et al., 1998
	DD78-6	2731	5.43	Atikwa	Trondhjemite	King et al., 1998
	31E	2733	5.57	Mulcahy Lake	Gabbro	King et al., 1998
	DD78-4	2732	5.07	Atikwa	Granodiorite	King et al., 1998
	DD87-41	2706	5.45	Dryberry batholith	Tonalite	King et al., 1998
	DD87-51	2695	5.58	Sandybeach Lake stock	Granitic	King et al., 1998
	TK76-30	2695	6.60	Taylor Lake stock	Quartz monzonite	King et al., 1998
	DD81-17	2717	5.42	Aulneau batholith	Tonalite	King et al., 1998

DD81-16	2710	6.28	Aulneau batholith	Granodiorite	King et al., 1998
DD78-19	2723	4.88	Kakagi Lake	Gabbro pegamtite	King et al., 1999
DD84-16	2709	5.46	Canoe Lake stock	Quartz diorite/granodiorite	King et al., 1998
DD84-17	2715	5.91	Painted Rock Island dome		King et al., 1998
DD84-19	2710	6.13	High Lake Stock late	Granodiorite	King et al., 1998
DD84-18	2727	5.47	High Lake Stock	Granodiorite	King et al., 1998
DD85-10	2723	5.76	Stevens Island	Quartz diorite	King et al., 1998
DD81-29	2701	5.90	Heronry	Diorite/monzonite	King et al., 1998
DD81-30	2723	5.69	Sabaskong batholith	Tonalite gneiss	King et al., 1998
96WB-22	2680	6.42	Jackfish Lake	Monzodiorite	King et al., 1998
DD96-4	2680	6.46	Jackfish Lake	Monzodiorite	King et al., 1998
S78-20	2698	6.49	Jackfish Lake	Quartz monzonite	King et al., 1998
DD81-12	2686	6.27	Ottertail stock	Quartz monzonite	King et al., 1998
DD81-14	2700	4.85	Bad Vermilion Lake	Trondhjemite sill	King et al., 1998
DD96-8	2700	6.40	Smirch Lake	Monzodiorite	King et al., 1998
WOB-86	2686	5.37	White Otter Batholith	Granodiorite	King et al., 1998
DD85-17	3000	5.00	Marmion batholith	Quartz phase	King et al., 1998
DD84-10	3003	4.95	Marmion batholith,	Banded gneiss core	King et al., 1998
DD78-17	2739	5.08	Pike Lake	Gabbro	King et al., 1998
DD78-18	2733	4.92	Beidelman Bay Pluton	Trondhjemite	King et al., 1998
DD96-11	2680	6.09	Roaring River	Granodiorite	King et al., 1998
DD96-10	2680	6.09	Roaring River	Monzodiorite	King et al., 1998
DD86-25a	2729	5.53	Lac des Iles	Tonalite	King et al., 1998
DD85-2	2691	5.82	Lac des Iles	Gabbro pegmatite	King et al., 1998
DD96-6	2688	6.83	Blalock Pluton	Quartz monzonite	King et al., 1998
C88-34	2698	6.57	Fletcher Lake Batholith	Granodiorite	King et al., 1998
C87-39	2697	6.90	Adamhay Lake Stock	Tonalite	King et al., 1998
C88-29	2698	6.47	Bluffy Lake Batholith	Diorite	King et al., 1998
C-88-23	2700	6.35	Graniteboss stock	Granodiorite	King et al., 1998
C-81-10	2718	5.90	Dome Stock	Granodiorite	King et al., 1998
C-83-19	2720	6.01	McKenzie stock	Granodiorite	King et al., 1998
C-83-21	2704	5.84	Killala stock granodiorite,	Granodiorite	King et al., 1998
C-87-17	2741	5.41	Ochig Lake Pluton	Trondhjemite	King et al., 1998
C-92-31	2684	6.18	Icarus	Monzodiorite	King et al., 1998
C-92-20	2681	6.30	Perching Gull Lake	Quartz-monzonite	King et al., 1998
C-92-30	2690	5.78	Saganaga	Tonalite	King et al., 1998
C-86-14	2678	6.53	Gowan Lake Pluton	Quartz monzonite	King et al., 1998
RN SHAFT	2728	5.59	Renabie mine	Tonalite	King et al., 1998

	RNLY3105	2728	5.26	Renabie mine	Trondhjemite	King et al., 1998
	C-82-17	2668	7.52	Mongoose Lake	Hornblendite	King et al., 1998
	C-82-18	2668	7.03	Mongoose Lake	Monzonite	King et al., 1998
	PN-78-5	2720	5.81	Wawbewawa	Porphyritic diorite	King et al., 1998
	K-76-2	2680	6.63	Otto Stock	Syenite	King et al., 1998
	PN-77-13	2689	4.67	Clarice lake	Quartz-diorite	King et al., 1998
	84-SM-19	2678	5.82	Garrison Stock	Monzonite	King et al., 1998
	TK83-6	2700	4.97	Bourlamaque batholith	Quartz diorite	King et al., 1998
	DD90-53	2672	5.78	Grenada mine	Syenite porphyry	King et al., 1998
British Tertiary	98S-SK40	2700	5.80	Lewisian Gneiss, xenolith	Tonalite gneiss	Monani and Valley, 2001
Igneous Province	95SK11	2700	5.15	Lewisian Gneiss, xenolith	Granulite gneiss	Gilliam and Valley, 1997
Manitouwadge		2720	4.38	GECO mine		Peck , 2000; Peck et al., 2000
		2720	2.40	GECO mine		Peck , 2000; Peck et al., 2000
	G90-4	2700	5.03	GECO	Rhyolite	King, 1997
	Winston Lake	2700	2.86		Rhyolite	King, 1997
Jack Hills,	W74/2-36	4404	5.50	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
W. Australia	W74/2-36	4404	7.40	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-1	4014	6.80	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-10	4146	5.60	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74/2-52	4133	7.20	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-43	4154	5.90	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-2	3378	6.10	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-8	3396	7.40	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-9	3452	5.60	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-4	3518	6.80	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-17	3385	6.50	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-19	3376	6.90	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-18	3444	5.70	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-20	3604	6.20	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-6	3509	6.50	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-5	3566	6.70	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-14	3698	5.00	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-7	3386	5.50	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-33	3390	6.70	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-34	3455	6.30	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-35	3279	6.20	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001
	W74-36	3412	6.20	Jack Hills Australia	Metaconglomerate detrital zircons	Peck et al., 2001

* References for the geochronology data and other geochemistry are contained within the references cited.

ANALYTICAL TECHNIQUES

Figure 1 (in main text) shows the $\delta^{18}O$ of zircons with measured U-Pb ages of 2.6 to 4.4 Ga (Table DR-1), and Figure 2 (in main text) shows histograms of $\delta^{18}O$ for these samples in comparison to olivine and zircon from the Earth's mantle. Detrital zircons from Jack Hills metasedimentary rocks were analyzed for lead and uranium isotope ratios by SHRIMP II ion microprobe and for oxygen isotope ratios by Cameca 4f ion microprobe on the same crystals (Wilde et al., 2001; Peck et al., 2001). These analyses of $\delta^{18}O$ are from 20 μm spots representing ~10^6 times smaller sample size than the laser fluorination analyses of younger zircons (5 ng vs. 2 mg). This improved spatial resolution is achieved at the trade-off of precision, which is poorer for the ultra small samples (±1‰) in comparison to ±0.07‰ for milligram-size samples (1sd, Valley et al., 1998). The Jack Hills zircons were also analyzed by laser fluorination in bulk for $\delta^{18}O$ yielding 6.05 ± 0.03‰ VSMOW in good agreement with the average ion microprobe value of 6.29 ± 0.60 ‰ (Peck et al. 2001). All other $\delta^{18}O$ values were measured by laser fluorination and mass spectrometry on 1-3 mg of zircon from aliquots of the same zircon concentrate that was dated by thermal ionization mass spectrometry (Gilliam and Valley, 1997; Valley et al., 1998; 2000; King, 1997, 2001; King et al., 1998, 2000; Peck, 2000; Peck et al., 2000; King, 2001; Monani and Valley, 2001) or on handpicked 1-3 mg samples of olivine (Mattey et al., 1994; Eiler et al., 1997). All published analyses of Jack Hills zircons are shown in Figure 1, except three crystals with anomalously low $^{206}Pb/^{238}U$ ages, <2 Ga, two of which also yield anomalously high values of $\delta^{18}O$ (Mojzsis et al., 2001), including a value of $\delta^{18}O$ = 15.0‰ relative to VSMOW, which is the highest value that has ever been measured in a zircon and is over 7‰ higher than any Archean zircon that has been measured by conventional techniques. Isotopic discordance and radiation damage have been shown to facilitate postmagmatic exchange of oxygen isotopes in zircon (Valley et al. 1994) and this could be a cause of anomalously high $\delta^{18}O$ values.

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