U-Pb zircon geochronological constraints on mylonitization in the Whipple Mountains

S1. Samples

Two samples PW81 and PW82 were collected from the upper section of Whipple Wash on the eastern side of the range (Figs 2 and S1).

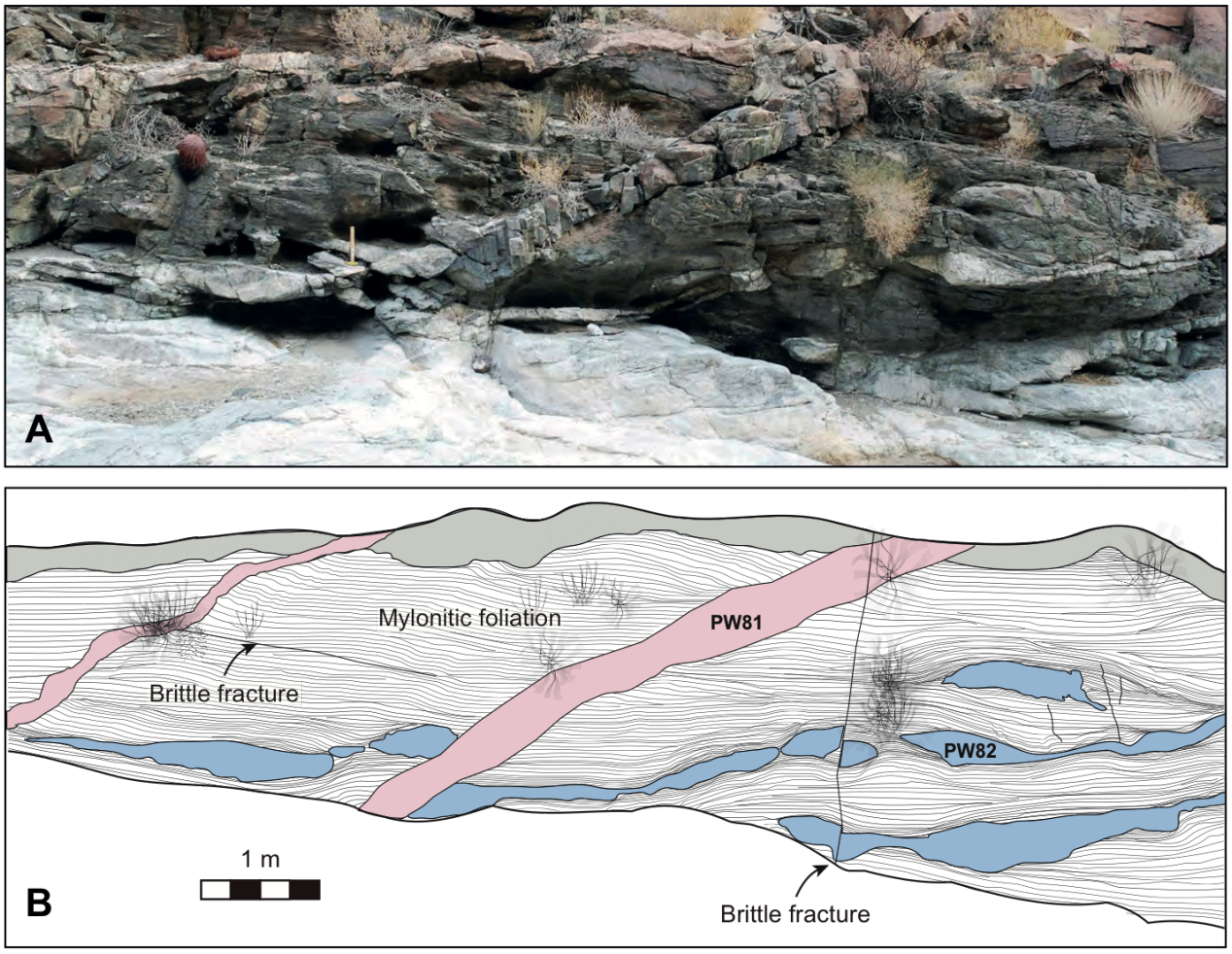

Figure S1. (A) Field photograph and (B) line drawing of deformed silicic dikes that are pre- and syn-kinematic with respect to development of the mylonitic foliation. Dike PW82 is boudinaged and lies parallel to the foliation, indicating that it pre-dates the mylonitic deformation. Dike PW81 cross-cuts the mylonitic foliation, but is itself mylonitized under high-temperature conditions of >450ºC, based on the presence of dynamically recrystallized feldspar. The age of this dike provides an approximate bracket for the onset of mylonitization in the Whipple Mountains footwall.

S2. U-Pb zircon analyses

U-Pb zircon analyses were performed at the University of California, Los Angeles on a CAMECA IMS 1270 ion microprobe in mono collection mode. Secondary ions were generated by sputtering with a 12 nA O^- primary beam with a spot size of 25 μm. Mass spectra were collected at a resolution of 5000 to exclude molecular interferences on Pb isotopes. Analyses consisted of 12 magnet cycles to ensure that no mixed age zones were encountered that could lead to spurious ages. Standard AS3 (1099.0 ± 0.7 Ma, Paces and Miller, 1993) was used to calibrate the U/Pb ratio calculations and all unknowns were within the measured UO/U range of AS3 standards. Standard 91500 (1063.6 ± 1.4 Ma, Schoene et al., 2006) was used to calculate concentrations of Th and U. Results are provided in Supplementary Table S1 and Figure S1. All dates are quoted at the 2σ confidence level.

Analyses of zircon rims, excluding older inherited cores, give weighted mean $^{206}Pb/^{238}U$ ages of 24.2 ± 1.0 Ma for PW81 and 65.7 ± 3.6 Ma for PW82.

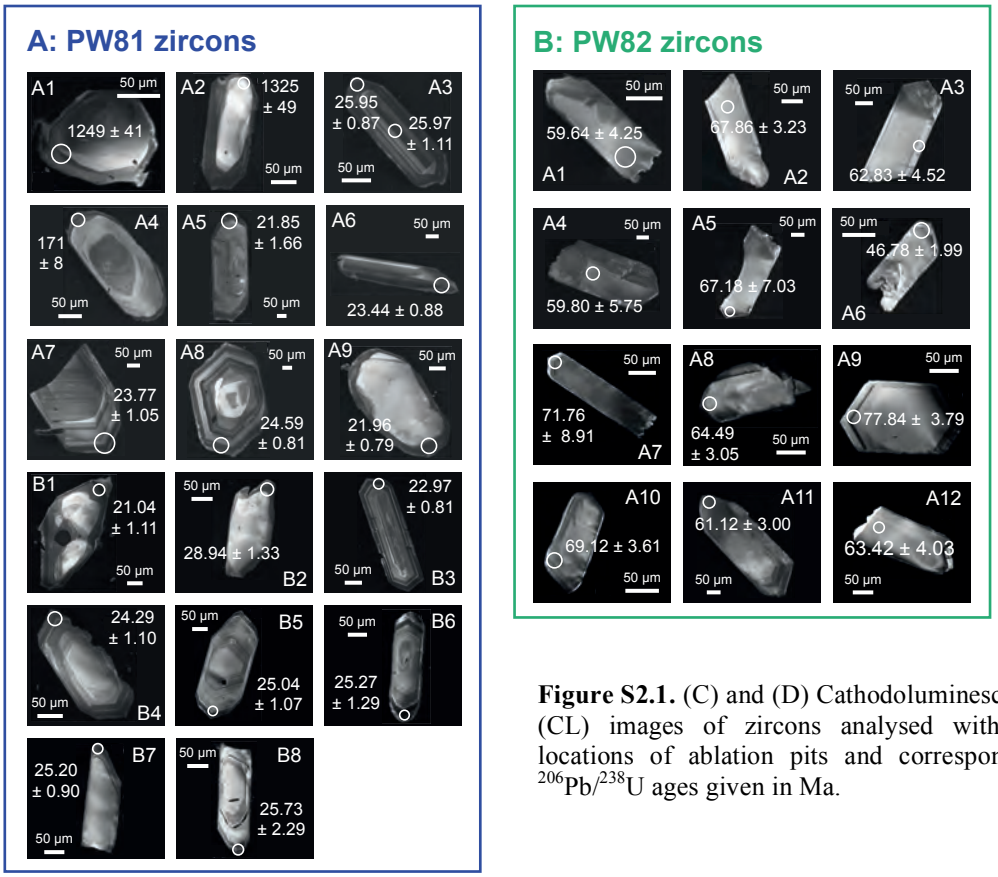

Figure S2.1. (C) and (D) Cathodoluminescence (CL) images of zircons analysed with the locations of ablation pits and corresponding $^{206}Pb/^{238}U$ ages given in Ma.

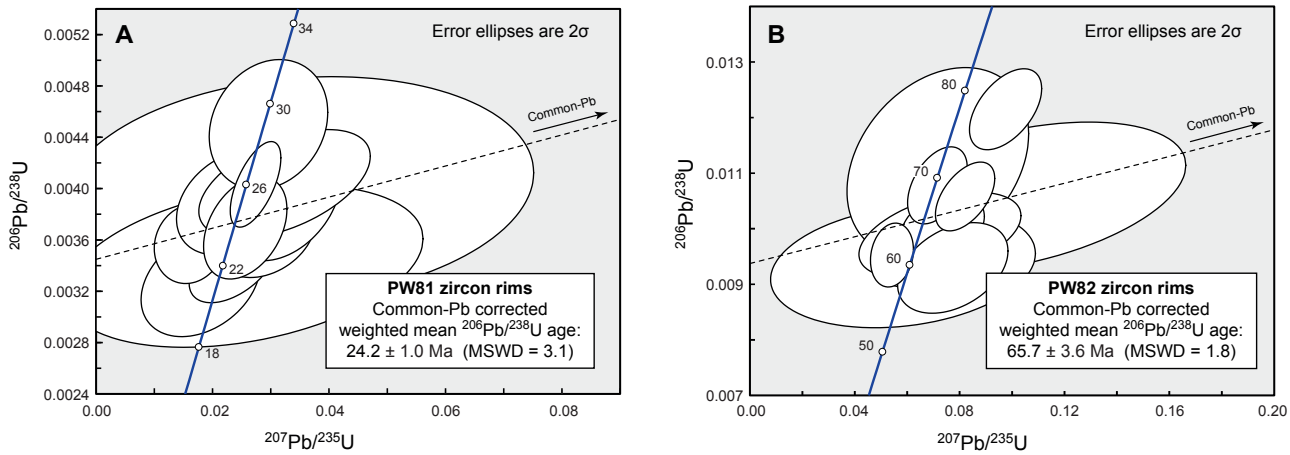

Figure S2.2. Wetherill concordia plots of zircon rim analyses for (A) PW81 and (B) PW82. Dashed lines indicate regressions from common Pb.

References

Paces, J. B. and Miller, J. D.: Precise U-Pb ages of Duluth Complex and related mafic intrusions, northeastern Minnesota: Geochronological insights to physical, petrogenetic, paleomagnetic, and tectonomagmatic processes associated with the 1.1 Ga Midcontinent Rift System, Journal of Geophysical Research, 98, 13997–14013, 1993, doi: 10.1029/93JB01159.

Schoene, B., Crowley, J. L., Condon, D. J., Schmitz, M. D., and Bowring, S. A.: Reassessing the uranium decay constants for geochronology using ID-TIMS U-Pb data, Geochimica et Cosmochimica Acta, 70, 426−445, 2006, doi: 10.1016/j.gca.2005.09.007.

Table S1: U-Pb zircon analyses of Whipple Mountain dikes

Sample	Analysis	Th	U	Th/U	206Pb*/ 238U	206Pb* 238U 1 s.e.	207Pb*/ 206Pb*	207Pb*/ 206Pb* 1 s.e.	207Pb*/ 235U	207Pb*/ 235U 1 s.e.	238U 206Pb	Rho	Age (Ma) 206Pb/ 238U	Age (Ma) 206Pb/ 238U 1 s.e.	Age (Ma) 207Pb/ 235U	Age (Ma) 207Pb/ 235U 1 s.e.	Age (Ma) 207Pb/ 206Pb	Age (Ma) 207Pb/ 206Pb 1 s.e.	Pb Correction	Rim/Core
PW81	A1	991	7649	0.13	0.21380	0.00771	0.08789	0.00032	2.59100	0.09531	4.6773	0.9951	1249.00	40.92	1298.00	26.95	1380.00	7.10	204Pb	Core
PW81	A2	393	934	0.42	0.22830	0.00931	0.08865	0.00124	2.79000	0.12880	4.3802	0.9557	1325.00	48.87	1353.00	34.50	1397.00	26.82	204Pb	Core
PW81	A3	4648	16660	0.28	0.00403	0.00014	0.04926	0.00253	0.02739	0.00178	247.9544	0.62	25.95	0.87	27.44	1.76	160.40	120.20	208Pb	Rim
PW81	A3-2	3693	3452	1.07	0.00404	0.00017	0.05815	0.00978	0.03237	0.00602	247.7087	0.51	25.97	1.11	32.34	5.92	535.50	368.20	208Pb	Rim
PW81	A4	109	1038	0.11	0.02687	0.00129	0.05504	0.00280	0.20390	0.01224	37.2162	0.57	170.90	8.09	188.40	10.32	414.00	113.80	208Pb	Core
PW81	A5	1	487	0.00	0.00340	0.00026	0.05450	0.02564	0.02551	0.01252	294.5508	0.34	21.85	1.66	25.58	12.39	391.60	1056.00	208Pb	Rim
PW81	A6	3163	5075	0.62	0.00364	0.00014	0.05800	0.00660	0.02913	0.00348	274.4990	0.31	23.44	0.88	29.16	3.44	529.80	249.30	208Pb	Rim
PW81	A7	72	2974	0.02	0.00370	0.00016	0.05029	0.00535	0.02562	0.00292	270.6360	0.36	23.77	1.05	25.69	2.89	208.60	246.70	208Pb	Rim
PW81	A7-2	496	971	0.52	0.09149	0.00619	0.09938	0.00219	1.25400	0.09248	10.9302	0.9551	564.30	36.54	825.00	41.67	1613.00	41.08	204Pb	Core
PW81	A8	246	17340	0.01	0.00382	0.00013	0.04868	0.00194	0.02565	0.00129	261.6431	0.61	24.59	0.81	25.72	1.27	132.50	93.77	208Pb	Rim
PW81	A9	289	3776	0.08	0.00341	0.00012	0.05006	0.00587	0.02355	0.00309	293.0832	0.50	21.96	0.79	23.64	3.07	197.70	272.40	208Pb	Rim
PW81	B1	8	1215	0.01	0.00327	0.00017	0.03985	0.00883	0.01796	0.00418	305.9039	0.32	21.04	1.11	18.07	4.17	-1.00	0.01	208Pb	Rim
PW81	B2	224	3321	0.07	0.00450	0.00021	0.04773	0.00665	0.02961	0.00416	222.2716	0.19	28.94	1.33	29.63	4.10	85.69	330.50	208Pb	Rim
PW81	B3	197	3450	0.06	0.00357	0.00013	0.03264	0.00504	0.01606	0.00248	280.1905	0.11	22.97	0.81	16.18	2.48	-1.00	0.01	208Pb	Rim
PW81	B4	93	2196	0.04	0.00378	0.00017	0.05213	0.00613	0.02713	0.00352	264.9007	0.43	24.29	1.10	27.18	3.48	291.10	268.40	208Pb	Rim
PW81	B5	322	2734	0.12	0.00389	0.00017	0.04371	0.00698	0.02345	0.00394	256.9373	0.32	25.04	1.07	23.54	3.91	-1.00	0.01	208Pb	Rim
PW81	B6	138	2318	0.06	0.00393	0.00020	0.05916	0.00717	0.03204	0.00410	254.5825	0.33	25.27	1.29	32.02	4.04	573.00	263.60	208Pb	Rim
PW81	B7	3302	10230	0.32	0.00392	0.00014	0.05433	0.00452	0.02934	0.00273	255.2974	0.45	25.20	0.90	29.36	2.69	384.70	186.90	208Pb	Rim
PW81	B8	4	617	0.01	0.00400	0.00036	0.06309	0.02964	0.03479	0.01649	250.0000	0.14	25.73	2.29	34.73	16.18	711.30	998.50	208Pb	Rim
PW82	A1	11	352	0.03	0.00929	0.00067	0.06039	0.01246	0.07739	0.01720	107.5963	0.37	59.64	4.25	75.69	16.21	617.70	445.50	208Pb	Rim
PW82	A2	43	994	0.04	0.01058	0.00051	0.05625	0.00543	0.08208	0.00924	94.5180	0.52	67.86	3.23	80.09	8.67	462.20	214.10	208Pb	Rim
PW82	A3	22	298	0.07	0.00979	0.00071	0.05344	0.01463	0.07217	0.02115	102.1033	0.38	62.83	4.52	70.76	20.03	347.70	618.90	208Pb	Rim
PW82	A4	5	198	0.03	0.00932	0.00090	0.04545	0.03148	0.05840	0.04128	107.2961	0.21	59.80	5.75	57.63	39.60	-1.00	0.03	208Pb	Rim
PW82	A5	6	168	0.04	0.01057	0.00110	0.07023	0.03345	0.10230	0.05228	94.6074	0.42	67.75	7.03	98.91	48.16	935.10	976.90	208Pb	Rim
~~PW82~~	~~A6~~	~~14~~	~~468~~	~~0.03~~	~~0.00728~~	~~0.00031~~	~~0.03383~~	~~0.01363~~	~~0.03397~~	~~0.01405~~	~~137.2872~~	~~0.30~~	~~46.78~~	~~1.99~~	~~33.92~~	~~13.80~~	~~-1.00~~	~~0.01~~	~~208Pb~~	~~Rim~~
PW82	A7	16	263	0.06	0.01119	0.00140	0.04644	0.01748	0.07168	0.02831	89.3655	0.30	71.76	8.91	70.29	26.82	20.42	903.80	208Pb	Rim
PW82	A8	17	555	0.03	0.01005	0.00048	0.05308	0.00894	0.07359	0.01295	99.5025	0.29	64.49	3.05	72.10	12.25	332.40	381.90	208Pb	Rim
PW82	A9	126	1204	0.10	0.01215	0.00060	0.05822	0.00581	0.09752	0.01125	82.3045	0.51	77.84	3.79	94.48	10.41	538.10	218.40	208Pb	Rim
PW82	A10	70	998	0.07	0.01078	0.00057	0.04812	0.00559	0.07153	0.00930	92.7644	0.45	69.12	3.61	70.15	8.82	105.40	274.30	208Pb	Rim
PW82	A11	48	1096	0.04	0.00953	0.00047	0.04125	0.00516	0.05418	0.00669	104.9759	0.17	61.12	3.00	53.57	6.45	-1.00	0.01	208Pb	Rim
PW82	A12	12	292	0.04	0.00989	0.00063	0.05319	0.01727	0.07250	0.02526	101.1531	0.45	63.42	4.03	71.07	23.91	336.80	735.50	208Pb	Rim

Key: Inherited core
Outside 2 sigma or removed as problematic