

Supplementary material Table_S1: Hf isotope results of Mud Tank zircon standard acquired during the experimental period

$^{176}\text{Hf}/^{177}\text{Hf}^*$	± 2	$\sigma^{178}\text{Hf}/^{177}\text{Hf}$	± 2	$\sigma^{180}\text{Hf}/^{177}\text{Hf}$	$\pm 2\sigma$	Total Hf	$\pm 2\sigma$	$^{176}\text{Lu}/^{177}\text{Hf}$	$\pm 2\sigma$	$^{176}\text{Yb}/^{177}\text{Hf}$	$\pm 2\sigma$
0.282498	0.000014	1.467370	0.000046	1.886630	0.000120	3.228230	0.089000	0.000036	0.0000002	0.001600	0.000005
0.282506	0.000019	1.467330	0.000044	1.886660	0.000073	3.263680	0.100000	0.000042	0.0000002	0.001786	0.000007
0.282511	0.000015	1.467280	0.000034	1.886730	0.000046	3.301950	0.056000	0.000030	0.0000002	0.001288	0.000012
0.282482	0.000016	1.467320	0.000040	1.886580	0.000074	2.756190	0.031000	0.000034	0.0000002	0.001405	0.000008
0.282496	0.000016	1.467360	0.000044	1.886910	0.000085	2.744650	0.049000	0.000035	0.0000004	0.001417	0.000006
0.282503	0.000017	1.467290	0.000034	1.886670	0.000077	2.576350	0.067000	0.000035	0.0000005	0.001467	0.000006
0.282493	0.000015	1.467400	0.000037	1.886600	0.000085	2.592180	0.058000	0.000032	0.0000003	0.001344	0.000008
0.282497	0.000015	1.467250	0.000042	1.886660	0.000092	2.618390	0.030000	0.000027	0.0000005	0.001168	0.000018
0.282501	0.000014	1.467310	0.000033	1.886710	0.000092	2.744310	0.047000	0.000037	0.0000005	0.001462	0.000023
0.282490	0.000016	1.467340	0.000039	1.886900	0.000095	2.943740	0.034000	0.000041	0.0000003	0.001752	0.000018
0.282498	0.000016	1.467340	0.000033	1.886960	0.000074	2.930840	0.027000	0.000043	0.0000003	0.001868	0.000006
0.282490	0.000015	1.467310	0.000049	1.886690	0.000093	2.703230	0.072000	0.000033	0.0000005	0.001499	0.000005
0.282481	0.000014	1.467330	0.000038	1.886890	0.000090	2.781460	0.021000	0.000037	0.0000004	0.001529	0.000007
0.282495	0.000014	1.467250	0.000040	1.886710	0.000077	2.992840	0.043000	0.000042	0.0000002	0.001744	0.000012
0.282525	0.000010	1.467300	0.000037	1.886760	0.000072	3.252770	0.047000	0.000038	0.0000002	0.001554	0.000009
0.282488	0.000015	1.467330	0.000026	1.886940	0.000063	3.054360	0.040000	0.000037	0.0000002	0.001494	0.000009
0.282500	0.000014	1.467370	0.000046	1.886860	0.000082	3.020080	0.053000	0.000046	0.0000003	0.002235	0.000008
0.282491	0.000013	1.467380	0.000028	1.886880	0.000088	3.088290	0.045000	0.000085	0.0000003	0.004383	0.000010
0.282507	0.000014	1.467360	0.000030	1.886820	0.000099	2.873530	0.032000	0.000032	0.0000003	0.001583	0.000006
0.282510	0.000014	1.467350	0.000029	1.886870	0.000066	3.050770	0.037000	0.000038	0.0000006	0.001830	0.000010
0.282510	0.000015	1.467370	0.000032	1.886850	0.000091	3.035210	0.039000	0.000039	0.0000006	0.001898	0.000006
0.282516	0.000015	1.467460	0.000056	1.886850	0.000080	2.405690	0.120000	0.000032	0.0000003	0.001661	0.000006
0.282512	0.000016	1.467350	0.000049	1.886550	0.000120	2.544190	0.120000	0.000029	0.0000002	0.001423	0.000004
0.282489	0.000018	1.467400	0.000064	1.886640	0.000089	1.996400	0.160000	0.000027	0.0000007	0.001243	0.000007
0.282512	0.000018	1.467400	0.000057	1.886810	0.000120	2.000590	0.160000	0.000027	0.0000008	0.001287	0.000006
0.282494	0.000019	1.467360	0.000038	1.886890	0.000071	1.828900	0.056000	0.000032	0.0000005	0.001521	0.000009
0.282496	0.000014	1.467370	0.000030	1.886800	0.000075	2.682390	0.044000	0.000022	0.0000004	0.001005	0.000024
0.282466	0.000017	1.467270	0.000052	1.886730	0.000083	2.568590	0.038000	0.000026	0.0000006	0.001345	0.000033
0.282489	0.000019	1.467240	0.000046	1.886650	0.000100	2.458800	0.042000	0.000029	0.0000003	0.001502	0.000006
0.282491	0.000019	1.467290	0.000035	1.887010	0.000088	2.345480	0.039000	0.000032	0.0000003	0.001602	0.000005
0.282510	0.000018	1.467270	0.000041	1.886770	0.000061	2.255790	0.030000	0.000044	0.0000006	0.002258	0.000009
0.282492	0.000018	1.467190	0.000045	1.886970	0.000110	2.288060	0.036000	0.000030	0.0000007	0.001533	0.000007
0.282521	0.000019	1.467360	0.000045	1.886770	0.000085	2.180420	0.039000	0.000041	0.0000003	0.002035	0.000006
0.282481	0.000014	1.467240	0.000040	1.886540	0.000083	2.019830	0.024000	0.000040	0.0000010	0.002014	0.000016
0.282503	0.000019	1.467330	0.000028	1.886560	0.000096	2.086350	0.021000	0.000041	0.0000005	0.002045	0.000006
0.282502	0.000018	1.467330	0.000046	1.886450	0.000091	2.117650	0.019000	0.000038	0.0000005	0.001918	0.000007
0.282490	0.000019	1.467280	0.000033	1.886590	0.000088	1.858380	0.021000	0.000035	0.0000003	0.001717	0.000007
0.282513	0.000020	1.467460	0.000050	1.886790	0.000110	1.961570	0.019000	0.000039	0.0000003	0.001874	0.000016
0.282490	0.000018	1.467380	0.000043	1.886670	0.000099	1.811190	0.024000	0.000032	0.0000002	0.001591	0.000010
0.282507	0.000015	1.467360	0.000030	1.886660	0.000088	1.938960	0.025000	0.000035	0.0000007	0.001727	0.000006
0.282519	0.000017	1.467280	0.000041	1.886770	0.000069	1.753430	0.028000	0.000032	0.0000003	0.001629	0.000011
0.282506	0.000019	1.467300	0.000059	1.887000	0.000094	1.795590	0.036000	0.000035	0.0000008	0.001686	0.000006

contd. Table DR1

$^{176}\text{Hf}/^{177}\text{Hf}^*$	$\pm 2\sigma$	$^{178}\text{Hf}/^{177}\text{Hf}$	$\pm 2\sigma$	$^{180}\text{Hf}/^{177}\text{Hf}$	$\pm 2\sigma$	Total Beam	$\pm 2\sigma$	$^{176}\text{Lu}/^{177}\text{Hf}$	$\pm 2\sigma$	$^{176}\text{Yb}/^{177}\text{Hf}$	$\pm 2\sigma$
0.282524	0.000018	1.467290	0.000044	1.886570	0.000130	1.842200	0.038000	0.000027	0.0000003	0.001250	0.000006
0.282481	0.000017	1.467340	0.000045	1.886890	0.000110	1.721650	0.032000	0.000029	0.0000005	0.001427	0.000007
0.282481	0.000020	1.467440	0.000050	1.886880	0.000110	1.772660	0.034000	0.000030	0.0000004	0.001557	0.000006
0.282501	0.000016	1.467280	0.000042	1.886620	0.000120	1.952300	0.045000	0.000030	0.0000007	0.001637	0.000010
0.282524	0.000018	1.467230	0.000046	1.886570	0.000140	1.808720	0.032000	0.000030	0.0000004	0.001549	0.000006
0.282504	0.000018	1.467350	0.000047	1.886890	0.000130	1.853800	0.024000	0.000031	0.0000005	0.001492	0.000009
0.282517	0.000015	1.467410	0.000045	1.886880	0.000099	1.759900	0.020000	0.000030	0.0000003	0.001566	0.000005
0.282520	0.000015	1.467380	0.000057	1.886820	0.000120	1.784750	0.027000	0.000034	0.0000003	0.001625	0.000010
0.282514	0.000018	1.467280	0.000046	1.886670	0.000080	1.989820	0.035000	0.000029	0.0000002	0.001306	0.000009
0.282502	0.000018	1.467330	0.000040	1.886960	0.000075	1.963730	0.035000	0.000023	0.0000003	0.001085	0.000006
0.282480	0.000019	1.467400	0.000036	1.886990	0.000091	1.741570	0.028000	0.000032	0.0000007	0.001571	0.000007
0.282478	0.000013	1.467390	0.000039	1.886860	0.000099	1.910680	0.024000	0.000041	0.0000005	0.001965	0.000005
0.282492	0.000018	1.467260	0.000048	1.886690	0.000089	1.804480	0.016000	0.000034	0.0000005	0.001635	0.000013
0.282511	0.000017	1.467390	0.000028	1.886660	0.000100	1.903400	0.018000	0.000029	0.0000005	0.001369	0.000016
0.282498	0.000017	1.467350	0.000046	1.886570	0.000087	1.922810	0.033000	0.000030	0.0000008	0.001446	0.000006
0.282500	0.000015	1.467400	0.000034	1.886890	0.000098	1.913120	0.034000	0.000022	0.0000006	0.001100	0.000006
0.282502	0.000019	1.467340	0.000036	1.886690	0.000130	1.997090	0.029000	0.000066	0.0000006	0.003258	0.000009

* mean $^{176}\text{Hf}/^{177}\text{Hf} = 0.282500 \pm 26$ (n = 59; long-term value = 0.282501 ± 28)

(1) Faraday detector for mass: L3 (172), L2 (174), L1 (175), Ax (176), H1 (177), H2 (178), H3 (179), H4 (180)

(2) $^{179}\text{Hf}/^{177}\text{Hf} = 0.7325$, $^{176}\text{Lu}/^{175}\text{Lu} = 0.02682$, $^{176}\text{Yb}/^{172}\text{Yb} = 0.58615$

Assume mass fractionation coefficient $f_{\text{Hf}} = f_{\text{Lu}} = f_{\text{Yb}}$; M: atomic mass

$$f_{\text{Hf}} = (\text{Log}(0.7325 / (^{179}\text{Hf}/^{177}\text{Hf})_{\text{Measured}})) / (\text{Log}(M^{179}\text{Hf} / M^{177}\text{Hf}))$$

$$^{176}\text{Lu} = ^{175}\text{Lu} \times 0.02682 / (M^{176}\text{Lu} / M^{175}\text{Lu})^{\wedge} f_{\text{Hf}}$$

$$^{176}\text{Yb} = ^{172}\text{Yb} \times 0.58615 / (M^{176}\text{Yb} / M^{172}\text{Yb})^{\wedge} f_{\text{Hf}}$$

$$^{176}\text{Hf}/^{177}\text{Hf} = ((^{176}\text{Hf} - ^{176}\text{Lu} - ^{176}\text{Yb}) / ^{177}\text{Hf})_{\text{Measured}} \times (M^{176}\text{Hf} / M^{177}\text{Hf})^{\wedge} f_{\text{Hf}}$$

$$^{178}\text{Hf}/^{177}\text{Hf} = (^{178}\text{Hf} / ^{177}\text{Hf})_{\text{Measured}} \times (M^{178}\text{Hf} / M^{177}\text{Hf})^{\wedge} f_{\text{Hf}}$$

$$^{180}\text{Hf}/^{177}\text{Hf} = (^{180}\text{Hf} / ^{177}\text{Hf})_{\text{Measured}} \times (M^{180}\text{Hf} / M^{177}\text{Hf})^{\wedge} f_{\text{Hf}}$$

$$\text{Total Hf} = ^{174}\text{Hf} + ^{176}\text{Hf} + ^{177}\text{Hf} + ^{178}\text{Hf} + ^{179}\text{Hf} + ^{180}\text{Hf} - ^{176}\text{Lu} - ^{176}\text{Yb}$$

$$^{176}\text{Lu}/^{177}\text{Hf} = (^{176}\text{Lu} / ^{177}\text{Hf})_{\text{Measured}} \times (M^{176}\text{Lu} / M^{177}\text{Hf})^{\wedge} f_{\text{Hf}}$$

$$^{176}\text{Yb}/^{177}\text{Hf} = (^{176}\text{Yb} / ^{177}\text{Hf})_{\text{Measured}} \times (M^{176}\text{Yb} / M^{177}\text{Hf})^{\wedge} f_{\text{Hf}}$$