

SUPPLEMENTARY TABLE DR1.
SAMPLE LOCATION DATA

Site/ Section	MHV member	type	Latitude (°N)	Longitude (°E)
A1117	dike	site	64.73438	-139.76778
A1118	sill	site	64.73637	-139.76372
A1119	dike feeder	site	64.73637	-139.76372
A1120	dike	site	64.68373	-139.86320
A1121	dike	site	64.68373	-139.86320
A1122	Seela Pass Fm.	5.6 m section	64.68060	-139.96107
A1123	Member A	49.0 m section	64.68060	-139.96107
A1125	Member A	21.9 m section	64.76650	-140.11252
A1126	Eagle Creek fm. (with basalt clasts)	conglomerate test/ 22 m section	64.76176	-140.12360
A1127	dike	site	64.76179	-140.12360
A1128	Member B	191.5 m section	64.70884	-140.04704
A1129	Eagle Creek fm. (with basalt clasts)	conglomerate test	64.70535	-140.04903
A1201	Member D-younger intrusion	site	64.66237	-140.01630
A1202	Member D- younger intrusion	site	64.66253	-140.00642
A1203	Member D	1.3 m section	64.66323	-140.00482
A1204	Member C	3 m section	64.28337	-140.82295
A1206	Member B	site	64.65967	-140.00342
A1207	Member D	site	64.28337	-140.82295
A1209	Member B and Eagle Creek fm.	273.0 m section	64.67632	-139.86698
A1210	Member A	55.4 m section	64.68047	-140.86070

Sample Analysis

If a specimen component fit had a $MAD > 15$, it was discarded from subsequent analysis. For samples with multiple specimens with the same component I used Fisher statistics to find an average component direction for the sample. The data was discarded if the associated $CSD > 20$. In some cases, if there were two specimens, one that seemed very different from all the other samples, and the other that was similar, then I would examine that specimen that was an outlier and exclude it from the mean if it seemed anomalous (unblocking temperatures, etc)

Finally, as this dataset was particularly noisy, some component directions did not always display desired precision. This was particularly apparent for the LT and HT components. For the LT components, I choose to exclude some LT component directions from the site/section means if they were very shallow or appeared to be drastically anomalous (~60 degrees away) from many of the other samples from the site/section. For the HT components, the main difference was that some components were upper hemisphere and some were lower hemisphere directions. In my analysis I split up the means into a lower hemisphere and upper hemisphere means. I then used the cutoff of $N > 3$ and $\alpha_{95} < 20$ for each mean. It was in this way that the HT1 and HT2 clusters became apparent and isolated.

SUPPLEMENTARY TABLE DR2.						
LOW-TEMPERATURE COMPONENT MEAN DIRECTIONS WITH $\alpha_{95} < 20^\circ$						
Site/Section	LT demag. temp.	D/I (in situ) ($^\circ$)	D/I (tilt corrected) ($^\circ$)	α_{95} ($^\circ$)	k	n/n _c
Approach 1						
A1128	100 °C	50.4/79.7	209.0/82	19.8	2.9	27/59
A1210	150 °C (LN-250 °C)	51.8/84.4	212.2/55.3	9.8	20.6	12/22
MHV Mean Direction		54.0/80.9 $\alpha_{95} = 5.8$ k=1886.5 CSD=1.86	209.2/69.7 $\alpha_{95} = 56.6$ k=21.6 CSD=17.42			2 sections 39 samples
Approach 2						
A1210	150 °C (LN-250 °C)	44.7/83.9	213.2/56.1	10.3	20.4	11flows 12/22
MHV Mean Direction		44.7/83.9 $\alpha_{95} = 10.3$ k=20.4	213.2/56.1 $\alpha_{95} = 10.3$ k=20.4			11 flows 1 section 12 samples
Approach 3						
N.D.						

D and I—mean declination and inclination
k—Fisher's (1953) precision parameter
 α_{95} —radius of confidence circle for the mean direction
n—number of samples used
n_c—total number of samples collected

**SUPPLEMENTARY TABLE DR3.
MID-TEMPERATURE COMPONENT DIRECTIONS $\alpha_{95} < 20^\circ$**

Site/ Section	MT demag. temp. (°C)	D/I (in situ) (°)	D/I (tilt corrected) (°)	α_{95} (°)	k	n/n _c
Approach 1						
A1123	425 (300-500)	145.4/-81.5	50.3/-51.5	7.3	28.6	15/17
A1125	450 (375-515)	67.2/-88.0	62.4/-36.1	5.0	128.2	7/11
A1126	450 (350-475)	225.6/-86.2	14.5/-54.8	9.3	31.7	8/10
A1128	475(200-530)	160.6/-84.0	60.2/-74.1	4.1	24.5	52/59
A1203	450(415-475)	196.6/-78.8	190.8/-70.9	4.8	135.7	6/7
A1204	425 (450-530)	167.4/-64.7	218.1/-75.5	14.9	27.3	5/8
A1209	425 (425-560)	145.0/-82.8	35.8/-45.6	8.9	19.4	15/21
A1210	475 (400-545)	120.1/-81.4	48.1/-48.5	2.8	155.9	19/22
MHV Mean Direction		161.7/-82.1 $\alpha_{95} = 5.9$ k=89.6	49.1/-65.4 $\alpha_{95} = 20.1$ k=9.5			8 sections 128 samples
Approach 2						
A1123	425 (300-500)	147.5/-82.2	49.1/-51.7	7.6	28.4	14 flows 15/17
A1125	450 (375-515)	67.2/-88.0	62.4/-36.1	5.0	128.2	7 flows 7/11
A1126	450 (350-475)	225.6/-86.2	14.5/-54.8	9.3	31.7	8/10
A1128	475(200-530)	176.4/-84.7	58.9/-77.9	6.5	40.9	13 flows 45/59
A1203	450(415-475)	196.7/-78.8	190.8/-70.9	8.6	845	2 flows 6/7
A1204	425 (450-530)	171.5/-63.2	217.9/-73.5	49.4 CSD=15.4	27.7	2 flows 5/8
A1209	425 (425-560)	145.6/-83.8	34.5/-45.2	9.2	19.5	14 flow 15/21
A1210	475 (400-545)	118.5/-81.3	48.1/-48.3	3.3	160.0	14 flows 19/22
MHV Mean Direction		164.4/82.3 $\alpha_{95} = 6.3$ k=79.4	48.4/-66.0 $\alpha_{95} = 20.6$ k=8.2			1 site 7 sections 74 stratigraphic horizons 121 samples
Approach 3						
A1128 Flow 1	475(200-530)	87.2/-66.2	134.2/-73.0	6.9	316.8	3/3
A1128 Flow 2	475(200-530)	207.1/-79.6	58.4/-81.8	12.2	102	3/4
A1128 Flow 2	475(200-530)	169.9/-73.1	102.6/-75.1	11.3	24.8	8/9
A1128 Flow 3	475(200-530)	213.4/-89.5	41.3/-72.5	4.9	55.7	16/18
A1203 Flow 1	450(415-475)	189.1/-80.2	186.4/-72.1	10	150.9	3/3
A1203 Flow 2	450(415-475)	202.6/-77.3	194.8/-69.6	12.7	94.8	3/4
A1204 Flow 1	425 (450-530)	148.3/-69.0	220/-84.4	12.2	102.4	3/6
A1210 Flow 1	475 (400-545)	124.2/-82.2	47.1/-49.2	12.3	101.8	3/4

SUPPLEMENTARY TABLE DR4. HIGH-TEMPERATURE HT2 COMPONENT DIRECTIONS WITH $\alpha_{95} < 20^\circ$						
Site/ Section	HT2 demag. temp. ($^\circ\text{C}$)	D/I (in situ)($^\circ$)	D/I (tilt corrected) ($^\circ$)	$\alpha_{95}(\text{^\circ})$	k	n/n _c
Approach 1						
A1123	565 (555-575)	51.6/-51.4	46.4/-11.7	18.6	7.0	11/17
A1128	570 (350-585)	37.5/-48.9	38.3/-30.9	16.8	30.7	4/59
A1209	680 (655-680)	61.7/-59.1	44.6/-15.6	14.36	74.7	4/21
A1210	595 (545-645)	58.6/-40.5	52.7/-2.8	10.1	14.2	16/22
MHV Mean Direction		52.2/-50.3 $\alpha_{95} = 11.7$ k=62.3	45.8/-15.3 $\alpha_{95} = 14.9$ k=39.0			4 sections 35 samples
Approach 2						
A1123	565 (555-575)	50.0/-51.4	45.3/-11.5	18.8	6.8	11flows 11/17
A1128	570 (350-685)	45.0/-46.2	44.1/-28.2	52.3 CSD= 16	25.0	2flows 4/59
A1209	680 (655-680)	61.7/-59.1	44.6/-15.6	14.36	74.7	4flows 4/21
A1210	595 (545-645)	60.18/-40.3	54.0/-3.1	12.2	15.1	11 flows 13/22
MHV Mean Direction		54.0/-49.5 $\alpha_{95} = 10.9$ k=72.3	47.1/-14.6 $\alpha_{95} = 13.0$ k=50.6			4 sections 28 flows 32 samples
Approach 3						
A1128 Flow 1	575	29.3/-51.1	32.2/-33.4	16.9	30.65	3/3
MHV Mean Direction		N. D.	N.D			

D and I— D and I—mean declination and inclination
k—Fisher's (1953) precision parameter
 α_{95} —radius of confidence circle for the mean direction
n—number of samples used
n_c—total number of stratigraphic horizons or samples collected

SUPPLEMENTARY TABLE DR5. HIGH-TEMPERATURE HT1 COMPONENT DIRECTIONS WITH $\alpha_{95} < 20^\circ$						
Site/ Section	HT1 demag. temp.(°C)	D/I (in situ)(°)	D/I (tilt corrected)(°)	α_{95} (°)	k	n/n _c
Approach 1						
A1126 matrix	560 (545-585)	349.1/80.9	209.1/59.0	16.4	57.7	4 [#] /5
A1126 clasts*	555 (530-585)	72.3/43.0	116.4/52.9	114.5	1.1	5/5
A1128	575 (400-630)	168.5/60.3	185.0/47.5	4.9	31.2	28/59
A1203	560-580	179.1/34.8	178.7/42.8	10.5	33.9	7/7
A1207	575-585	5.3/-21.2	5.5/-29.2	13.3	18.3	9/9
A1209	575-685	170.9/74.9	196.7/29.8	12.35	13.3	12/21
MHV Mean Direction[†]		179.1/58.1 $\alpha_{95} = 31.3$ k=6.9	190.0/42.1 $\alpha_{95} = 14.3$ k=29.5			1 site and 4 sections 60 samples
Approach 2						
A1126 matrix	560 (545-585)	349.1/80.9	209.1/59.0	16.4	57.7	4 horizons 4/5 (2c)
A1126 clasts*	555 (530-585)	72.3/43.0	116.4/52.9	114.5	1.1	5/5
A1128	575 (400-630)	158.9/58.8	177.7/47.8	8.5	29.6	11 flows 28/59
A1203	560-580	179.5/35.0	179.2/43.0	13.1	367	2 flows 7/7
A1207	575-585	5.3/-21.2	5.5/-29.2	13.3	18.3	1 flow 9/9
A1209	575-585	149.4/79.5	195.8/36.2	14.8	11.6	10 flow 10/21
MHV Mean Direction[†]		175.6/59.2 $\alpha_{95} = 32.7$ k=6.4	188.4/43.5 $\alpha_{95} = 13.6$ k=32.4			1 site and 4 sections 28 stratigraphic horizons/flows 58 samples
Approach 3						
A1203 Flow 1	560-580	176.7/33.2	176.0/41.1	18.6	25.3	4/4
A1203 Flow 2	560-580	182.4/36.9	182.5/44.9	19.7	40.4	3/3
A1207	575-585	5.3/-21.2	5.5/-29.2	13.3	18.3	9/9
A1128 Flow 1	500-575	157.4/64.2	174.8/54.6	15.4	36.5	4/4
A1128 Flow 2	560-605	183.9/60.7	196.3/45.1	8.8	47.9	7/9
A1128 Flow 3	575-630	163.8/51.4	178.0/39.7	16.45	57.2	3/3
A1128 Flow 4	400-575	156.6/66.6	182.3/55.0	13.0	50.25	4/19
MHV Mean Direction[†]		174.9/48.3 $\alpha_{95} = 14.6$ k=18.1	182.4/44.4 $\alpha_{95} = 7.7$ k=61.8			7 flows 34 samples

D and I— D and I—mean declination and inclination

k—Fisher's (1953) precision parameter

α_{95} —radius of confidence circle for the mean direction

n—number of samples used

n_c—total number of stratigraphic horizons or samples collected

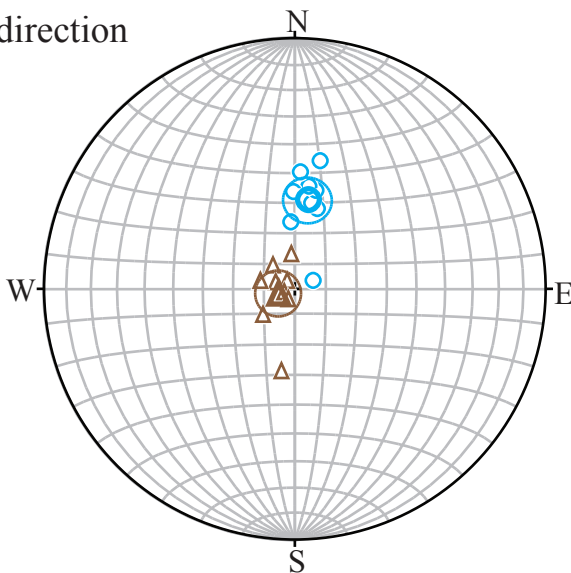
*Not used in mean direction

[†]Used reversed A1207 site mean direction in calculation

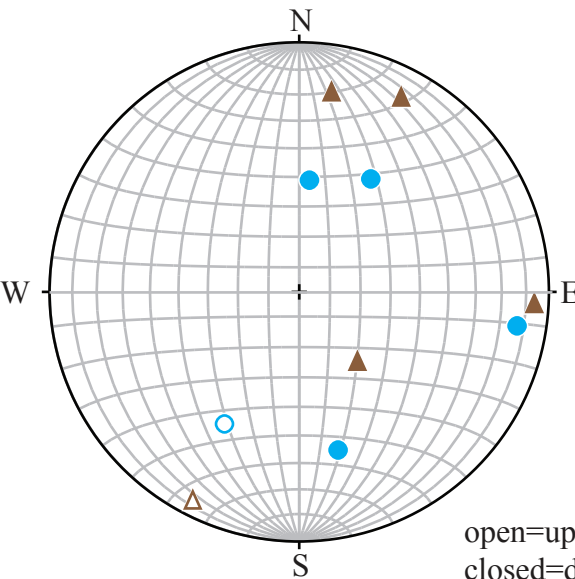
[#]2 of these samples are great circle fits

Figure DR1. A1126 Conglomerate test Eagle Creek Formation-Rapitan Group Equivalent

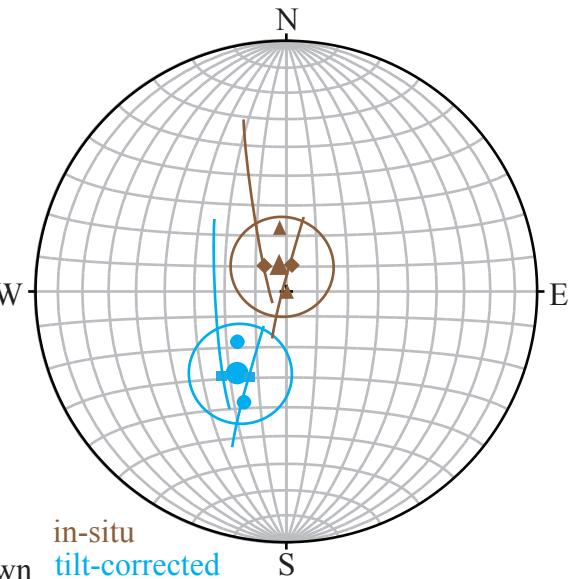
A. All samples MT direction



B. Clast HT directions



C. Matrix HT directions



open=up
closed=down

in-situ
tilt-corrected

**SUPPLEMENTARY TABLE DR6.
WATSON'S V STATISTIC TEST FOR THE APPROACH 1 MT POLE**

	Kent and Irving 2010 70 Ma pole	Besse and Courtillot, 2002 77.9 Ma pole	Torsvik et al., 2012 80 Ma Pole
MT pole Post-rotation	Watson's V: 1.0 Vcritical: 7.0 PASS	Watson's V: 1.5 Vcritical: 6.7 PASS	Watson's V: 0.9 Vcritical: 6.8 PASS
MT pole Pre-rotation	Watson's V: 7.8 Vcritical: 6.9 FAIL	Watson's V: 6.9 Vcritical: 6.7 FAIL	Watson's V: 8.6 Vcritical: 6.8 FAIL

SUPPLEMENTARY TABLE DR7.

Rotation parameters for the reconstructions in Figures 7 and 8. Figure 7 only reconstructs Yukon block.

Craton/block/terrane	Euler Pole		Angle of Rotation (°)
	Latitude (°N)	Longitude (°E)	
720 Ma			
Laurentia	-44.77	-14.89	133.98
Yukon block*	-66.81	45.17	54.99
Amazonia	1.47	52.28	110.1
Pampean/Rio de La Plata	2.77	52.94	135.76
Sao Francisco	9.65	54.38	129.51
Baltica	45.09	-143.91	177.44
Congo	16.74	85.88	126.21
West Africa	4.46	82.71	135.73
Kalahari	22.36	83.48	122.25
Australia	-11.67	-124.32	-89.35
North China	1.44	178.52	-127.11
India	67.52	70.38	35.07
Siberia	6.01	-18.79	59.41
Tarim	37.04	122.87	-133.4
615 Ma			
Laurentia	-31.65	26.07	145.61
Yukon block*	0.0	0.0	101
Amazonia	15.85	56.36	143.78
Pampean/Rio de La Plata	15.92	52.13	144.2
Sao Francisco	11.72	54.46	137.73
Baltica	33.91	-132.86	175.83
Congo	17.73	83.46	133.94
West Africa	22.01	84.04	136.37
Kalahari	19.32	83.66	133.19
Australia	-2.47	-141.79	-76.98
North China	4.28	9.57	146.82
India	22.3	-58.21	-31.33
Siberia	12.44	-176.67	-109.38
Tarim	31.22	108.16	-139.28

* rotated relative to Laurentia