Supplementary materials

Table S1. ChRM directions measured by PCA method for the previous Spid samples (Rahimi, 2017).

Id	*Statistics*	*Range*	*n*	*Dg*	*Ig*	*MAD*
S1A4	DirOKir	N004-N080	17	209.2	-62.6	1.1
S1B2	DirOKir	N004-N080	17	181.9	-59.6	0.8
S2A2	DirOKir	N004-N080	17	107.7	-72.4	2.4
S2B2	DirOKir	N004-N080	17	90.7	-67.4	1.4
S3A3	DirOKir	N004-N080	17	102.2	-86.5	1.6
S3B2	DirOKir	N004-N080	17	126.9	-60.4	0.9
S4A2	DirOKir	N004-N080	17	245.6	-73.6	0.9
S4B4	DirOKir	N004-N080	17	204.7	-29.8	4.2
S5A3	DirOKir	N004-N080	17	212.9	-59.7	2.6
S5B2	DirOKir	N004-N080	17	253.5	-59	2.6
S6A2	DirOKir	N004-N080	17	187.8	-76.8	1.5
S6B2	DirOKir	N004-N080	17	88.5	-72.3	1
S7A2	DirOKir	N004-N080	17	143.9	-79.9	1.4
S7B2	DirOKir	N008-N080	16	96.8	-76.2	1.9
S8A4	DirOKir	N004-N080	17	39.8	-83.1	2.6
S8B2	DirOKir	N008-N080	16	69.4	-77.2	0.4
S9A4	DirOKir	N008-N080	16	122.8	-74.7	1.9
S9B3	DirOKir	N012-N080	15	220	-76.7	1.7
S10A2	DirOKir	N016-N080	14	229.4	-77.2	0.5
S10B3	DirOKir	N012-N080	15	68.1	-67.4	2.2
S11A3	DirOKir	N008-N080	16	253.1	-73.5	1.2
S11B2	DirOKir	N004-N080	17	317.2	-87.5	1.8
S12A2	DirOKir	N016-N080	14	188.5	-83.7	0.3
S12B2	DirOKir	N016-N080	14	139.6	-79.6	0.8
S13A4	DirOKir	N008-N080	16	121.3	-61.4	4.7
S13B2	DirOKir	N008-N080	16	270.6	-68.5	1
S14A2	DirOKir	N004-N080	17	243.7	-68	2.3
S14B2	DirOKir	N004-N080	17	236.1	-63.6	1.1
S15A2	DirOKir	N008-N080	16	263.2	-78.9	3.9
S15B2	DirOKir	N016-N080	14	24.5	-73.7	0.8
S16A2	DirOKir	N008-N080	16	46.6	-76.8	1.3
S16B2	DirOKir	N012-N080	15	67.4	-71.7	0.9
S17A2	DirOKir	N016-N080	14	42.2	-79	7.9
S17B3	DirOKir	N004-N080	17	17.3	-58.2	3.8
S18A2	DirOKir	N008-N080	16	50.9	-88.8	1.5
S18B2	DirOKir	N008-N075	15	17.5	-80.3	0.9
S19A3	DirOKir	N008-N080	16	85.8	-77.5	1.6
S19B4	DirOKir	N004-N080	17	27.8	-86.1	1.9
S20A2	DirOKir	N008-N080	16	308.9	-81.3	0.8
S20B2	DirOKir	N004-N080	17	137	23.9	1.6

Table S2. ChRM directions measured by PCA method for Spid samples (this study).

Id	Statistics	Range	n	Dg	Ig	MAD
SA1-2	Dir Kir	N450-N620	6	246.7	-57.7	8.5
SA6-1	Dir Kir	N450-N660	7	231.6	-58.2	6.3
SB1	DirOKir	N310-N590	8	244	-38.4	2.8
SB1	DirOKir	N250-N640	12	244.4	-38.1	2.4
SB1	Dir Kir	N310-N450	4	234.3	-29.7	2.8
SB1	DirOKir	N500-N590	4	246.3	-39.3	2.9
SB10	Dir Kir	N250-N400	5	39.4	-59.1	6.4
SB10b	Dir Kir	N450-N590	5	31.3	-55.1	5.2
SB2	Dir Kir	N120-N590	14	11.7	61.7	11.1
SB2	Dir Kir	N240-N480	8	41.5	73.8	12.2
SB3	Dir Kir	N250-N590	10	342.4	1.7	4.8
SB3	DirOKir	N250-N590	10	336.5	1.3	3.6
SB5	Dir Kir	N280-N590	9	262.4	-24.9	7.4
SB5	Dir Kir	N280-N450	5	256.2	-29.7	1.8
SB5	Dir Kir	N500-N590	5	280.5	3	10.8
SB5	Dir Kir	N310-N450	4	257	-28.5	2.1
SB6	Dir Kir	N310-N590	8	304	-44.5	3.1
SB7	Dir Kir	N250-N530	8	276.7	6.6	22.2
SB7	Dir Kir	N450-N590	5	169.5	-68.8	1.5
SB7-1	Dir Kir	N014-N080	19	314.9	-61.4	3.3
SB7-1	DirOKir	N085-N100	4	174.9	-24.3	4
SB8	Dir Kir	N160-N680	17	297.7	-53.1	6.7
SB8b	DirOKir	N660-N680	3	234.4	-43.4	2.1
SC1	Dir Kir	N310-N450	4	9.5	-74.3	10.3
SC1b	Dir Kir	N500-N590	4	294.3	-63.2	4.4
SC3	Dir Kir	N120-N590	13	342	65.6	3.2
SC4	DirOKir	N250-N660	13	171.3	-3.8	3.2
SC4b	Dir Kir	N250-N660	13	171.5	-1.7	4.1
SC5a	Dir Kir	N250-N400	5	249.8	-13	24.7
SC5b	Dir Kir	N450-N640	7	227.7	-31.9	4.7
SC6	Dir Kir	N250-N660	11	157.3	-39.3	9
SC7	Dir Kir	N240-N590	10	194.5	-38	2.9
SC8a	DirOKir	N250-N660	13	176.3	-35.3	3.5
SD1	Dir Kir	N200-N590	11	269.2	-63.7	1.5
SD2	Dir Kir	N200-N360	5	58.3	-63.6	1.8
SD3	Dir Kir	N450-N660	8	300.7	-76.1	3.5
SD3-1	Dir Kir	N020-N065	12	27	-37.1	3.1
SD3-1	DirOKir	N080-N100	5	166.2	-41	1.6
SD3a	Dir Kir	N250-N400	5	358.5	-81.8	4.4
SE1	Dir Kir	N280-N590	9	189.4	-71.9	2.6
SE2	Dir Kir	N200-N590	11	104.3	-73.3	3.8
SE2-1	Dir Kir	N024-N065	11	39.2	-45.8	4
SE2-1	DirOKir	N080-N100	5	80	-43.2	0.9
SF1	Dir Kir	N240-N620	10	237.4	22.8	2.1
SF1-1	Dir Kir	N026-N060	9	2.5	-39.7	2.1
SF1-1	DirOKir	N085-N100	4	37.9	-30.3	2.3
SF2	Dir Kir	N200-N590	11	248.9	-65.7	5.7
SG1	Dir Kir	N340-N560	6	182.6	-53.2	6.7
SG2	Dir Kir	N400-N590	5	1.6	-56.6	1.3
SG3a	Dir Kir	N250-N560	10	82.4	35.6	8.1
SG4	Dir Kir	N240-N360	4	150.3	-36.1	1.3
SG5	Dir Kir	N280-N590	8	8.7	-73.7	2.6
SG5-1	Dir Kir	N045-N100	12	216.3	-41.9	5.7
SG6a	Dir Kir	N250-N640	12	118.1	-65.4	3.7
SG6b	DirOKir	N250-N640	12	116.4	-64.8	2.2

Table S3. ChRM directions measured by PCA method for Zaghar samples

Id	Statistics	Range	n	Dg	Ig	MAD
ZA1	DirOKir	N250-N450	6	45.8	18.3	9.6
ZA1	Dir Kir	N250-N450	6	39.5	62.2	33.3
ZA2	Dir Kir	N280-N560	8	182.3	-54.1	5.3
ZA4	Dir Kir	N250-N400	5	216.9	-63.2	3.8
ZA4	Dir Kir	N250-N340	4	218.5	-64.2	5.5
ZA4b	Dir Kir	N400-N530	4	270.4	-68.4	5.3
ZA4b	DirOKir	N400-N530	4	249.4	-67.8	4.5
ZA5	Dir Kir	N280-N560	5	99.5	84.3	5.3
ZA6	Dir Kir	N280-N530	7	20.1	-72.9	3.8
ZA6	Dir Kir	N250-N530	8	17.1	-73.6	3.4
ZB1a	Dir Kir	N004-N035	8	134	-16.8	6.2
ZB2	Dir Kir	N250-N340	4	136.5	-65.8	3.3
ZB2	DirOKir	N250-N590	10	140.5	-65.9	2.4
ZB3	Dir Kir	N200-N360	5	214	-25	2.9
ZB5	Dir Kir	N750-N950	5	257.7	-33.1	12.8
ZB5a	Dir Kir	N000-N240	7	176.9	-75.4	9.3
ZB5a	Dir Kir	N450-N700	4	84.1	-51.1	21.1
ZB6	Dir Kir	N200-N360	5	268.9	-70.6	1.4
ZC1	Dir Kir	N250-N530	8	291.4	-35.3	7.6
ZC1	DirOKir	N250-N450	6	292.6	-34	5
ZC2	Dir Kir	N240-N360	4	253	-50.5	1.3
ZC3	Dir Kir	N250-N340	4	167.3	22.6	9.7
ZC4	Dir Kir	N250-N530	7	256.3	-38.1	6.7
ZC4	Dir Kir	N250-N450	6	252.8	-36.5	10.8
ZC4b	DirOKir	N250-N450	5	259.4	-38.4	5.3
ZC5a	DirOKir	N040-N700	15	310.8	-39.8	4.4
ZC7	Dir Kir	N200-N360	5	305.6	-39.5	2.5
ZD1	Dir Kir	N200-N520	8	54.4	-81	5.4
ZD2a	DirOKir	N250-N660	13	143.6	-62.1	1.7
ZD2b	Dir Kir	N250-N660	13	143.1	-62.5	2.6
ZD2b	DirOKir	N250-N660	13	105.7	-54.5	2.4
ZD3a	Dir Kir	N250-N400	5	352.9	-58.7	3.3
ZD3b	Dir Kir	N450-N660	8	353	-69.4	4.5
ZD4a	DirOKir	N250-N660	13	147.2	-73.8	3
ZD4b	Dir Kir	N250-N660	13	146.2	-75.1	4.4
ZD5b	Dir Kir	N400-N660	8	296.3	-65.1	4.9
ZD5c	DirOKir	N400-N660	8	294.4	-65.4	3.3
ZD5q	Dir Kir	N250-N340	4	286.8	-72.4	9
ZD6	Dir Kir	N240-N620	11	165.7	-76.2	5.5
ZD7a	Dir Kir	N250-N400	5	94.3	-57.7	4.1
ZD7b	DirOKir	N450-N620	6	131.5	-58.1	2.9
ZD8a	Dir Kir	N250-N530	8	289.7	-83.4	2.9
ZD8b	Dir Kir	N560-N640	4	230	-79.8	2
ZE1a	Dir Kir	N250-N560	8	199	-79.3	7.5
ZE1b	DirOKir	N250-N560	8	174.1	-75.2	6.3
ZE2a	Dir Kir	N310-N450	4	87.7	-72.7	7
ZE3	Dir Kir	N250-N590	10	67	-73.5	4
ZE3	Dir Kir	N250-N560	9	67	-72	3.5
ZE3	Dir Kir	N280-N560	8	63	-72	3.7
ZE3a	Dir Kir	N250-N450	6	77	-70	3.2
ZE3B	Dir Kir	N500-N590	4	68.7	-80	5.1
ZE4	Dir Kir	N250-N530	8	163.1	-74.9	9.5
ZE4	Dir Kir	N500-N590	4	63.9	-74.2	4.1
ZE4b	DirOKir	N500-N530	2	81	-73.7	1.2
ZE5	Dir Kir	N250-N450	6	294	-61.8	4.6
ZE5b	Dir Kir	N560-N660	6	158	71.2	4.6

Table S3. Continued.

Id	Statistics	Range	n	Dg	Ig	MAD
ZE6	Dir Kir	N160-N590	12	121.7	-73.4	3.4
ZE6a	Dir Kir	N160-N360	6	128.7	-70.1	5
ZE6b	DirOKir	N400-N640	9	104.3	-73.8	2.7
ZE7	Dir Kir	N310-N560	7	44.7	-49.4	3.6
ZE7a	DirOKir	N250-N660	14	45.6	-48.8	3.8
ZE7a	DirOKir	N250-N560	9	46.1	-48	1.6
ZE7b	Dir Kir	N250-N660	14	44.8	-50.3	3.6
ZE7b	Dir Kir	N250-N560	9	47	-48.1	3.2
ZE8	Dir Kir	N240-N560	9	277.9	-26.9	9.7
ZE8a	Dir Kir	N120-N320	6	290.6	-53.5	8.4
ZE9	Dir Kir	N250-N310	3	299.1	-60.8	9.2
ZE9a	DirOKir	N250-N590	10	248.9	-66	2.7
ZF1	Dir Kir	N250-N310	3	309.4	-56.2	4.7
ZF10	Dir Kir	N340-N500	4	317.2	-63.2	8.3
ZF1a	DirOKir	N340-N530	5	321.1	-58.8	3
ZF1b	Dir Kir	N340-N530	5	329.5	-55.9	5.5
ZF2	Dir Kir	N250-N530	8	325	-81.2	3.7
ZF3	Dir Kir	N200-N520	9	85.1	-54.4	8.3
ZF4	Dir Kir	N20-N310	4	57.5	-53.5	4
ZF4a	DirOKir	N340-N530	5	72.1	-60.4	2.2
ZF4b	Dir Kir	N340-N530	5	68.9	-58.1	4.5
ZF5a	Dir Kir	N250-N340	4	254	-79.3	3.9
ZF5b	Dir Kir	N400-N590	6	33.4	-81.3	3
ZF6	Dir Kir	N250-N530	8	257.6	-58.9	4.4
ZF6a	Dir Kir	N20-N310	4	262.2	-47.2	1.8
ZF6b	Dir Kir	N340-N530	5	273.9	-60.3	8
ZF7	Dir Kir	N250-N310	3	240.5	-85.7	3.8
ZF7a	Dir Kir	N20-N310	4	312.8	-85.9	2.3
ZF8	Dir Kir	N200-N590	11	241.3	-78.7	5.5
ZF9	Dir Kir	N250-N310	3	76.1	-50.1	2.2
ZF9a	Dir Kir	N20-N310	4	63.8	-54.7	2.3
ZF9b	Dir Kir	N340-N530	5	90.6	-54.5	6.7
ZF9b	DirOKir	N340-N530	5	96	-54.1	4.4
ZG1	Dir Kir	N250-N450	6	146.7	-59.8	7.8
ZG2	Dir Kir	N250-N280	2	112.8	-67.2	0.1
ZG2	Dir Kir	N250-N450	6	121.5	-47.1	4.2
ZG2b	DirOKir	N250-N450	6	129.5	-48.7	2.7
ZG3	Dir Kir	N250-N530	8	180.7	-48.2	3.9
ZG3b	DirOKir	N250-N530	8	178.2	-52.6	2.4
ZG4	Dir Kir	N160-N560	10	70.8	34.6	12.5
ZG5	Dir Kir	N160-N560	6	90.3	6.6	8.2

Table S4. Summary of all used ChRM directions and associated statistical analysis from Spid pluton.

Site	Rock type	Lat (°N)	Long (°E)	N	n	D (°)	I (°)	α95	k
SA	Diorite	437458	3837582	2	2	239.2	-58.2	17.5	206.4
SB	Diorite	437213	3837889	23	21	68.1	49.7	18.3	3.7
SC	Diorite	437287	3837873	12	10	12.4	44.1	23.2	4.5
SD	Diorite	437370	3837843	6	6	6.6	-81.2	16.7	17
SE	Diorite	437365	3837886	3	3	131.5	-76.7	20.8	36.1
SF	Diorite	437414	3837814	4	4	228.4	68	74.5	2.5
SG	Diorite	437457	3837769	8	8	335.1	73.4	29.5	4.5
Mean				58		41.3	67.7	11.8	3.5

Note: Lat (°N) and Long (°E) are site latitude and site longitude respectively; N and n is number of specimens analyzed from a site and number of specimens considered for final calculations; D (°) and I (°) are the mean remanence declination and mean remanence inclination; α95 = 95% confidence circle on mean remanence; k is the Fisher (1953) precision parameter; MAD is the maximum angular deviation.

Table S5. Petrophysical data of the special core analyses 50 for the studied intrusions in Tafresh.

Sample	*Rock type*	m_d(g)	*h (mm)*	*phi (mm)*	ρ_b (g/cm3)	*Km*	W_S	W_W	Φ_W(%)	Φgas(%)	ρ_g
S11A4	Diorite	23.13	21	22.6	2.75	29588.44	23.16	0.03	0.36		2.76
S13B3	Diorite	22.96	21	22.8	2.68	6928.39	23.00	0.04	0.47		2.69
S13B4	Diorite	23.5	21.2	22.7	2.74	8980.11	23.58	0.08	0.93		2.77
S14A3	Diorite	22.59	21.1	22.6	2.67	155.72	22.83	0.24	2.84		2.75
S14A4	Diorite	22.3	20.9	22.6	2.66	138.26	22.50	0.20	2.39	2.65	2.73
S15A3	Diorite	23.4	21.1	22.8	2.72	27509.96	23.42	0.02	0.23		2.72
S15A4	Diorite	23.33	21.1	22.8	2.71	30266.16	23.36	0.03	0.35		2.72
S15B3	Diorite	23.45	21.1	22.6	2.77	30098.45	23.48	0.03	0.35		2.78
S15B4	Diorite	22.83	20.4	22.5	2.82	32733.65	22.86	0.03	0.37		2.83
S16A3	Diorite	22.94	21.1	22.5	2.74	21760.70	23.00	0.06	0.72		2.76
S16A4	Diorite	23.15	21.2	22.7	2.70	19969.09	23.22	0.07	0.82		2.72
S16B3	Diorite	22.99	21.6	22.5	2.68	26487.38	23.02	0.03	0.35		2.69
S16B4	Diorite	23.13	21.3	22.7	2.68	27331.63	23.17	0.04	0.46		2.70
S17A3	Diorite	21.73	21.2	22.7	2.53	238.85	22.39	0.66	7.70	8.68	2.75
S18A2	Diorite	21.97	21.4	22.7	2.54	7881.18	22.30	0.33	3.81		2.64
S18A3	Diorite	22.05	21.2	22.7	2.57	8414.22	22.39	0.34	3.96		2.68
S18B2	Diorite	21.99	21.2	22.5	2.61	9399.89	22.30	0.31	3.68		2.71
S18B3	Diorite	22.2	21.3	22.5	2.62	9853.18	22.50	0.30	3.54	6.46	2.72
S19B5	Diorite	20.58	19.5	22.7	2.61	7139.93	20.68	0.10	1.24	3.81	2.64

S1B4	Diorite	22.09	20.1	22.7	2.72	2938.65	22.21	0.12	1.48		2.76
S20A3	Diorite	22.69	21.1	22.6	2.68	12217.58	22.78	0.09	1.08	-0.31	2.71
S3B3	Diorite	23.51	21.3	22.8	2.70	4128.98	23.54	0.03	0.35	0.84	2.71
S3B4	Diorite	21.22	19.6	22.7	2.68	1950.83	21.26	0.04	0.50		2.69
S4A3	Diorite	23.23	21.1	22.7	2.72	14399.92	23.31	0.08	0.94		2.75
S4A4	Diorite	22.96	21.1	22.7	2.69	13732.91	23.02	0.06	0.73	0.14	2.71
S5B3	Diorite	23.49	21.2	22.9	2.69	7495.64	23.54	0.05	0.53	2.65	2.71
S6A3	Diorite	23.44	21.4	22.7	2.71	20625.32	23.46	0.02	0.23		2.71
S6A4	Diorite	23.49	21.4	22.5	2.76	21142.45	23.51	0.02	0.24	0.15	2.77
S6B4	Diorite	22.36	20.6	22.7	2.68	25221.40	22.38	0.02	0.24		2.69
S7A4	Diorite	23.31	21.1	22.6	2.76	25395.60	23.35	0.04	0.47		2.77
S7B3	Diorite	23.06	21.1	22.6	2.73	11202.62	23.10	0.04	0.47		2.74
S7B4	Diorite	22.96	21.1	22.7	2.69	13405.60	22.99	0.03	0.35		2.70
S8B3	Diorite	23.27	21.4	22.5	2.74	17945.48	23.34	0.07	0.82		2.76
S9A2	Diorite	22.52	21.1	22.4	2.71	28389.80	22.58	0.06	0.70	-0.14	2.73
SE2-3	Diorite	27.2	21.3	24.6	2.69	222.44	27.40	0.20	1.94	4.90	2.74
SF1-2	Diorite	24.88	18.8	24.5	2.81	398.30	25.01	0.13	1.47		2.85
SF2-3	Diorite	27.17	21.1	24.6	2.71	565.25	27.41	0.23	2.34	6.18	2.78
SG4-3	Diorite	27.44	21.2	24.7	2.70		27.60	0.16	1.54	2.17	2.74
SN17A4		22	21.1	22.5	2.62	264.63			0.00		2.62

m_d (dry weight); h (height of core), phi (diameter of core); ρ_b (bulk density); Km (magnetic susceptibility); W_s (saturation weight); W_w (water weight); Φ_w (measured porosity using water), Φ_{gas} (measured porosity using helium) and ρ_g (grain density).

Table S5. Continued.

Sample	***Rock type***	***m_d(g)***	***h (mm)***	***phi (mm)***	***ρ_b (g/cm3)***	***Km)***	***W_S***	***W_W***	***Φ_W(%)***	***Φgas(%)***	***ρ_g***
ZD1-3	Granite	23.03	21.8	23.9	2.36	221.11	23.38	0.35	3.57	12.90	2.44
ZD3-4	Granite	24.16	21.2	23.8	2.56	449.88	24.36	0.20	2.12		2.62
ZD4-2	Granite	22.5	20	23.8	2.53	1065.60	22.79	0.29	3.26		2.62
ZD9-2	Granite	24.28	21.1	23.9	2.57	321.07	24.53	0.25	2.62	3.81	2.64
ZE1-3	Mafic dyke	24.52	21.8	23.8	2.53	186.19	24.80	0.28	2.89		2.60
ZE1-4	Mafic dyke	23.8	20.9	23.9	2.54	186.19	24.04	0.24	2.60	5.18	2.61
ZE2-3	Mafic dyke	24.182	21.7	23.6	2.55	135.56	24.28	0.10	1.03		2.58
ZE3-2	Mafic dyke	24.69	21.5	24	2.54	123.99	24.74	0.05	0.51		2.55
ZE4-4	Mafic dyke	24.38	22.4	23.8	2.45	136.52	24.68	0.30	3.01		2.52
ZE6-3	Mafic dyke	24.56	21.2	23.9	2.58		24.74	0.18	1.85	3.93	2.63