S1 Different lithospheric field estimates

This supplement contains tables with all the different lithospheric field estimates for the individual field components discussed in the main text.

S1.1 Southern Africa

Table S1: Repeat station lithospheric anomaly values without magnetospheric correction for the southern African region.

Nr	X [nT]	σX [nT]	Y [nT]	σY [nT]	Z [nT]	σZ [nT]	F [nT]	σF [nT]	*Nr. of data	Code
OBS1	5.69	10.21	13.16	3.67	19.43	4.90	-17.64	1.49	9	HER
OBS2	69.15	11.92	-25.15	7.15	43.18	4.91	-5.52	5.18	9	HBK
OBS3	20.33	10.31	-46.02	4.97	91.51	3.91	-66.80	2.64	9	TSU
1	-1.87	8.26	-17.58	6.05	62.62	2.47	-54.03	4.25	4	hum
2	-43.61	9.59	-92.01	5.01	3.68	3.35	-3.08	2.80	4	geo
3	-62.90	5.90	-30.43	2.04	100.77	3.84	-109.02	0.88	4	gon
4	38.67	3.26	-47.57	4.49	-94.82	0.92	108.79	0.55	3	kar
5	62.97	9.68	-25.89	3.48	-79.61	3.66	101.12	2.17	5	cra
6	-36.07	13.40	-7.55	2.98	-82.95	1.29	63.29	4.19	5	wil
7	-120.92	12.49	-131.11	2.90	58.98	2.60	-78.56	4.48	4	fon
8	-7.74	5.99	75.53	3.74	43.34	1.59	-53.52	1.50	5	gar
9	108.56	8.26	-135.24	4.91	141.75	1.92	-68.44	2.83	4	blo
10	-151.11	9.83	-104.06	4.09	-3.95	2.58	-39.36	1.91	4	und
11	-16.35	5.36	-56.65	3.46	114.71	1.25	-100.46	1.86	2	lad
12	-46.88	8.15	8.34	2.49	48.20	0.25	-63.29	3.12	4	dou
13	64.69	6.65	-154.69	2.79	15.05	1.08	31.44	2.89	4	ale
14	167.51	21.59	186.18	6.70	-296.04	2.95	310.57	6.59	2	upi
15	-117.39	5.20	86.70	4.59	18.60	4.44	-81.70	3.53	3	stl
16	-90.44	9.04	-42.98	3.83	119.23	3.02	-137.82	2.35	5	pie
17	86.97	11.17	-9.16	1.04	-184.31	4.24	203.12	2.97	4	lud
18	189.97	20.33	156.11	4.82	-72.19	3.02	123.66	6.24	5	sev
19	-12.90	17.26	66.86	3.41	158.18	4.81	-156.43	3.29	5	sos
20	-31.00	9.36	-137.28	3.71	-20.99	1.93	21.73	2.81	5	uni
21	76.39	10.52	-72.07	3.08	195.27	3.17	-126.70	2.33	2	mic
22	-18.65	12.82	-142.09	6.18	-193.57	3.25	181.77	3.94	5	tsh
23	5.13	15.67	-51.38	4.67	-275.50	4.40	253.17	4.30	5	khu
24	-178.90	5.65	-323.50	3.36	-598.56	3.21	485.46	2.07	5	tom
25	151.83	6.17	146.76	7.50	-70.11	1.06	112.60	2.45	2	swa
26	-43.13	11.58	34.68	3.32	-18.38	4.59	-5.21	2.69	5	win
27	-40.07	10.35	28.38	4.69	4.69	2.05	-24.21	2.86	5	gob
28	95.81	13.75	1.06	5.71	82.12	4.18	-25.47	3.88	4	mes
29	-22.41	8.02	10.67	6.20	77.58	2.58	-79.99	3.34	5	gha
30	-33.05	9.65	-3.08	2.55	56.69	4.19	-65.09	3.89	4	ora
31	100.52	18.46	-68.82	7.29	426.37	5.96	-314.01	5.32	4	fra
32	177.55	9.38	-310.03	1.59	-391.33	1.76	459.50	2.84	4	uga
33	40.66	3.68	93.96	2.40	-108.48	2.38	106.65	1.90	4	mau
34	51.20	8.18	-73.93	1.67	20.31	2.21	12.81	3.30	3	tsk
35	-10.39	15.34	28.03	2.53	79.02	2.65	-76.54	5.09	4	oka
36	86.26	4.73	-22.91	2.16	77.84	2.00	-18.96	1.36	3	mpa
37	-43.15	12.56	-118.47	2.05	-33.88	5.04	18.04	1.82	4	rua

Magnetic field components X, Y, Z and F with their standard deviations σ, * Number of used data points in time series.

Table S2: Observatory and repeat station lithospheric anomaly values with magnetospheric correction for the southern African region.

Nr	X [nT]	σX [nT]	Y [nT]	σY [nT]	Z [nT]	σZ [nT]	F [nT]	σF [nT]	*Nr. of data	Code
OBS1	25.33	2.06	9.40	1.84	32.91	1.74	-21.99	2.61	9	HER
OBS2	90.31	3.73	-28.86	5.45	54.06	3.84	-5.66	5.26	9	HBK
OBS3	42.79	2.68	-49.76	3.49	99.24	2.32	-62.52	2.24	9	TSU
1	5.62	5.70	-18.69	6.63	70.07	2.42	-57.68	4.19	4	hum
2	-31.39	4.54	-94.07	4.07	14.23	3.00	-7.67	3.69	4	geo
3	-53.94	3.32	-31.56	2.04	109.07	2.52	-112.74	0.71	4	gon
4	45.43	1.14	-48.64	4.86	-88.92	0.92	106.12	1.35	3	kar
5	75.51	5.99	-28.19	3.19	-69.89	2.53	97.61	2.13	5	cra
6	-27.57	6.57	-8.78	1.95	-77.01	2.11	61.26	3.98	5	wil
7	-108.27	9.59	-133.39	3.04	66.82	2.87	-80.46	3.28	4	fon
8	2.03	2.43	73.95	3.67	50.35	0.67	-56.09	1.19	5	gar
9	114.40	2.97	-136.02	5.14	146.71	1.87	-70.66	1.91	4	blo
10	-137.31	4.07	-106.31	6.23	6.46	4.89	-42.67	2.38	4	und
11	-1.52	2.52	-59.06	1.66	123.75	0.33	-102.19	0.19	2	lad
12	-39.90	3.05	7.23	3.47	53.56	2.85	-65.24	2.60	4	dou
13	72.91	3.21	-156.01	2.30	20.73	1.67	29.49	2.97	4	ale
14	185.77	3.60	182.96	3.08	-285.94	3.58	308.91	5.05	2	upi
15	-110.76	2.09	86.13	5.03	24.24	2.29	-83.78	3.08	3	stl
16	-77.43	5.43	-44.89	3.70	128.23	3.47	-139.91	2.50	5	pie
17	101.51	3.21	-11.64	2.89	-175.59	3.34	201.02	2.98	4	lud
18	198.36	8.03	154.95	2.69	-67.08	1.79	122.58	4.79	5	sev
19	0.22	4.38	64.74	2.92	165.87	1.54	-157.93	2.83	5	sos
20	-19.03	3.36	-139.13	3.78	-14.27	1.93	20.78	2.33	5	uni
21	95.00	1.08	-75.13	1.60	206.18	1.19	-127.36	1.65	2	mic
22	-2.93	2.98	-144.81	3.90	-185.18	4.72	181.21	3.90	5	tsh
23	17.23	2.20	-53.00	3.48	-269.04	4.10	252.95	3.70	5	khu
24	-167.39	4.29	-325.17	2.56	-592.02	3.23	485.18	1.54	5	tom
25	158.62	0.22	145.69	6.35	-65.57	1.17	111.46	1.66	2	swa
26	-29.54	4.05	32.32	1.67	-11.47	2.08	-5.37	1.91	5	win
27	-26.55	3.17	26.17	4.73	11.84	2.04	-24.53	2.06	5	gob
28	107.66	4.79	-0.59	5.52	88.93	2.36	-25.57	2.98	4	mes
29	-11.19	3.88	9.12	6.14	83.43	2.82	-79.97	2.55	5	gha
30	-23.10	4.60	-4.40	1.52	61.98	4.10	-64.89	3.14	4	ora
31	115.80	7.11	-71.07	5.67	434.16	1.46	-313.20	3.97	4	fra
32	193.34	3.74	-312.56	2.80	-383.88	3.88	460.02	2.06	4	uga
33	51.24	1.49	92.55	2.33	-103.35	1.45	107.41	1.21	4	mau
34	63.67	5.10	-75.70	1.03	26.12	1.65	13.83	3.30	3	tsk
35	1.09	3.35	26.28	0.61	84.28	1.86	-75.57	2.32	4	oka
36	92.12	3.72	-23.49	2.44	81.32	1.79	-18.80	1.28	3	mpa
37	-23.82	6.50	-121.44	4.52	-25.86	1.79	21.03	2.57	4	rua

Magnetic field components X, Y, Z and F with their standard deviations σ, $*$ Number of used data points in time series.

Table S3: Comparison of X and Y lithospheric anomaly estimates for the southern African region.

Data-X	R-SCHA-X	X-EMM-720	X-EMM-200	Data-Y	R-SCHA-Y	Y-EMM-720	Y-EMM-200	Code
5.6	-15.8	13.3	-50	-18.7	9.7	-10.9	-2.4	hum
-31.4	-47.0	-37	-53.9	-94.1	4.5	-40	-19.6	geo
-53.9	-46.1	-36.4	-14.4	-31.6	-75.2	-68	-34.2	gon
45.4	71.4	58.4	20.7	-48.6	-59.6	-40.4	-42.7	kar
75.5	-74.7	9.1	16.1	-28.2	56.5	1.4	13.2	cra
-27.6	75.0	-6.4	-16	-8.8	-6.3	0.5	22.4	wil
-108.3	100.2	-14.7	7.8	-133.4	-40.5	-101.4	0.8	fon
2	40.2	27	-7.7	74	-65.7	10.4	25	gar
114.4	-143.4	-35.6	-20.5	-136	2.0	-50.8	-7.3	blo
-137.3	-21.4	-58.3	-25.7	-106.3	-140.5	-91.8	-73.2	und
-1.5	-30.6	-19.4	-16	-59.1	-42.9	-18.3	-32.5	lad
-39.9	-7.8	-0.1	-11.7	7.2	80.4	-11.8	66.5	dou
72.9	-131.3	-32.2	-11.9	-156	-101.2	-88.4	-69.1	ale
185.8	-123.9	11.9	14.5	183	-207.8	-12.9	-35.7	upi
-110.8	-103.1	-80.1	10.6	86.1	-6.7	25.6	-18.4	stl
-77.4	37.7	7.4	2.9	-44.9	212.0	52.5	-17.7	pie
101.5	28.8	30.8	22.2	-11.6	-102.0	-62.1	-18.3	lud
198.4	-115.9	1.7	-18.5	155	26.7	105.2	1.1	sev
0.2	45.6	14.4	20.8	64.7	-21.9	4.5	5.8	sos
-19	39.7	15	45.3	-139.1	-45.5	-104.7	-28.7	uni
95	89.2	97.1	22	-75.1	-52.9	-54.3	-51.3	mic
-2.9	103.8	54.8	47.8	-144.8	-41.7	-83.7	-16.5	tsh
17.2	95.3	47.3	35.8	-53	-96.5	-24.1	-23.1	khu
-167.4	258.1	165.3	-32.6	-325.2	111.2	-25	28.2	tom
158.6	224.3	173.8	52.1	145.7	-73.4	-22.4	8	swa
-29.5	52.2	22.4	0.2	32.3	72.4	-5.2	-2	win
-26.6	-7.5	-14.5	-18	26.2	91.6	39.3	18.2	gob
107.7	-114.8	-78.7	-75.5	-0.6	-77.7	-63.9	-7.1	mes
-11.2	-53.2	-11.2	-52.7	9.1	-23.7	-16.3	-24.9	gha
-23.1	-14.9	0	-19.2	-4.4	-81.3	-10.7	-27.9	ora
115.8	-109.5	-8.6	8.1	-71.1	13.5	-18.2	-13.9	fra
193.3	-7.6	62	-6.6	-312.6	58.6	-28.2	42.9	uga
51.2	-87.6	32	13.4	92.6	-66.5	20	-11.8	mau
63.7	181.5	72.8	-28.4	-75.7	-106.1	-31	-25.3	tsm
1.1	3.2	-2.5	4.6	26.3	-2.2	41.2	3.2	oka
92.1	52.1	42.8	42.8	-23.5	-33.1	-73.5	-45.2	mpa
-23.8	-23.8	47.8	71.5	-121.4	18.5	-37.9	-38.3	rua
25.3	72.0	33.3	34.6	9.4	10.1	18	4.5	HER
90.3	18.8	77.2	-58.4	-28.9	-37.4	-19	-0.2	HBK
42.8	84.9	59.9	34	-49.8	-110.5	-62.3	-47.1	TSU

Magnetic field components X and Y from ground data (Data), regional model (R-SCHA) and global model (EMM) up to spherical harmonic degree and order 720 or 200, respectively.

Table S4: Comparison of Z and F lithospheric anomaly estimates for the southern African region

Data-Z	R-SCHA-Z	Z-EMM-720	Z-EMM-200	Data-F	δF	F-EMM-720	F-EMM-200	Code
70.1	90.2	71.1	107.1	-57.7	3	-56.9	-115.4	hum
14.2	41.5	32.9	97.8	-7.7	29	-36.5	-105.5	geo
109.1	63.9	74.8	61.1	-112.7	-41	-67.7	-53.6	gon
-88.9	-45.5	-75.6	-29	106.1	156	97.6	41.4	kar
-69.9	-20.8	-50.4	-95.9	97.6	102	48.8	90.4	cra
-77	12.2	-116.3	-7.1	61.3	112	103.7	-3.1	wil
66.8	-37.2	-3.1	-19	-80.5	-31	13.8	20.2	fon
50.4	-76.9	-40.3	-23	-56.1	42	45.5	14.6	gar
146.7	72.8	42.3	55.7	-70.7	-16	-44.7	-57.6	blo
6.5	-15.2	10.7	-0.5	-42.7	-12	-16.8	3.1	ung
123.8	-37.6	41.9	5	-102.2	-84	-42.5	-5.6	lad
53.6	115.9	51.2	117.3	-65.2	-19	-44.7	-120.8	dou
20.7	246.0	116.9	31.4	29.5	79	-107.7	-24.2	ale
-285.9	-269.8	-163.4	-47.8	308.9	283	155.3	54.1	upi
24.2	14.6	4	-28.2	-83.8	-59	-42.2	32.8	stl
128.2	147.9	203.5	98.5	-139.9	-76	-185.6	-83.3	pie
-175.6	151.4	21.8	47.6	201	171	-0.7	-32.9	lud
-67.1	-350.7	-50.7	-65.2	122.6	171	33.5	51.4	sev
165.9	-124.1	39.7	34	-157.9	32	-30.9	-23.2	sos
-14.3	25.0	-7.5	-59.1	20.8	177	24.6	75.3	uni
206.2	3.2	75.4	29.1	-127.4	-74	-13.8	-8.5	mic
-185.2	-134.3	-88.3	-23.7	181.2	252	111.7	43.4	tsh
-269	47.3	-47.9	-1.4	253	249	66.2	19.6	khu
-592	276.8	-120	49.5	485.2	359	184.9	-61.9	tom
-65.6	-190.4	-96.2	-48.7	111.5	134	162.1	65	swa
-11.5	39.6	18.9	59.1	-5.4	120	-6.9	-52.9	win
11.8	-9.9	-7.6	-19.4	-24.5	79	-3.2	7.8	gob
88.9	-172.0	-123.3	5.2	-25.6	-101	77.1	-39.9	mes
83.4	84.2	105.2	22.7	-80	30	-96.9	-41.7	gha
62	-79.0	-25.3	-10.6	-64.9	28	23.1	2.8	ora
434.2	-361.9	-72.7	-27.8	-313.2	285	60.8	29.4	fra
-383.9	-133.8	-205.1	-7	460	431	213.2	-0.7	uga
-103.4	-15.4	-74.8	-65	107.4	169	79	64	mau
26.1	-53.0	-156.2	12.2	13.8	190	173.9	-22.2	tsm
84.3	112.0	111.0	68.1	-75.6	29	-102	-57.9	oka
81.3	37.1	10.5	21.3	-18.8	128	18.7	7.6	mpa
-25.9	39.5	20.2	40.3	21	358	9.4	3.9	rua
32.9	-76.6	28.7	33.9	-22	30	-16.9	-18.8	HER
54.1	-25.8	139.5	4	-5.7	22	-88.2	-28.7	HBK
99.2	60.1	59.9	15.4	-62.5	82	-18.9	6.5	TSU

Magnetic field components Z and F from ground data (Data), regional model (R-SCHA) or high resolution aeromagnetic map (δF) and global model (EMM) up to spherical harmonic degree and order 720 or 200, respectively.

S1.2 Germany

Table S5: Repeat station lithospheric anomaly values without magnetospheric correction for Germany.

Nr	X [nT]	σX [nT]	Y [nT]	σY [nT]	Z [nT]	σZ [nT]	F [nT]	σF [nT]	*Nr. of data	Code
1	103.38	5.94	-96.10	2.87	125.58	6.19	153.54	3.75	3	lis
2	12.12	1.05	87.57	1.99	-15.20	4.11	-9.15	3.41	2	eis
3	96.37	6.40	51.21	1.21	114.71	8.88	142.12	6.46	3	alt
4	-19.72	6.52	-32.33	3.56	-32.83	6.35	-38.01	3.73	5	ban
5	33.70	6.17	-19.25	2.35	-95.68	6.72	-77.57	4.43	5	kan
6	104.62	1.48	-44.46	1.91	25.78	0.33	61.80	0.13	2	hel
7	66.54	0.30	82.61	0.51	88.06	0.68	107.34	0.72	2	bug
8	7.03	6.05	-59.30	2.98	-72.35	8.02	-65.55	5.50	5	kam
9	75.90	2.55	-3.53	0.36	144.07	4.70	161.79	3.46	2	bot
10	45.83	7.04	46.15	1.91	-60.86	7.21	-39.84	4.26	8	WNG
11	-8.61	4.66	25.82	4.21	-3.80	5.59	-6.60	3.73	3	bor
12	105.84	4.47	31.00	2.42	-120.57	4.62	-72.77	3.12	4	kob
13	69.51	4.94	-26.89	1.24	-37.34	5.26	-9.24	3.28	4	goe
14	18.85	4.57	-18.71	2.44	-114.71	5.03	-99.85	3.19	4	tan
15	52.05	7.27	31.26	3.78	150.73	6.17	159.69	3.27	4	hop
16	-23.37	8.10	26.73	3.68	-53.79	8.83	-58.54	5.36	3	eml
17	-15.68	1.05	-31.11	0.66	-55.61	3.06	-57.88	2.06	2	jeg
18	-23.40	4.60	10.35	3.35	-64.99	5.22	-68.95	3.32	4	lie
19	-30.53	6.69	0.78	2.43	-70.10	6.96	-76.55	4.10	8	NGK
20	23.53	9.38	16.17	4.16	-24.19	9.21	-13.13	4.83	3	tel
21	-35.41	8.29	8.98	0.73	-45.92	13.04	-55.92	8.92	3	sch
22	-8.09	9.73	11.27	4.48	-50.85	7.50	-49.99	3.10	3	kee
23	-24.34	8.59	17.79	2.48	-43.01	7.26	-48.91	3.33	3	cla
24	-39.42	6.74	23.86	3.14	-51.33	6.99	-62.40	3.88	4	gtt
25	-177.19	7.73	56.32	2.50	-12.02	8.71	-79.62	4.94	4	col
26	-89.60	7.77	-61.12	2.81	7.80	7.34	-29.03	3.75	4	deu
27	43.07	5.87	-37.10	4.33	-2.47	9.49	14.47	6.59	4	die
28	-30.78	7.71	4.61	3.44	-50.58	7.44	-58.66	3.70	3	eub
29	-14.65	7.39	22.91	4.92	145.32	6.88	127.36	3.34	4	gru
30	-36.96	9.65	25.05	4.61	-13.07	6.24	-26.79	1.86	4	obe
31	-59.73	7.73	-6.38	5.94	-52.38	8.15	-72.07	4.93	5	sos
32	-34.70	6.68	-18.81	4.24	-45.40	7.25	-55.81	4.05	5	eil
33	-37.80	7.48	-40.84	4.13	-23.87	5.64	-37.41	2.21	5	ebe
34	16.60	8.89	-86.08	3.38	37.28	5.53	40.82	2.41	5	rad
35	-0.04	6.83	-4.62	3.40	-36.25	6.39	-33.13	3.35	5	won
36	12.67	7.18	-31.30	6.38	17.95	5.26	21.57	1.85	4	nos
37	79.60	8.35	-20.88	5.64	95.12	5.94	119.72	2.23	5	mer
38	-23.91	7.85	-19.26	6.04	-26.47	7.32	-34.32	3.64	5	gai
39	-17.88	8.76	20.06	2.17	27.48	6.46	17.12	2.02	4	ber
40	-35.73	5.45	-18.00	1.66	-2.26	8.47	-17.68	5.59	3	poi
41	-23.93	6.34	-20.18	3.83	10.76	5.62	-0.78	2.68	5	wit
42	-1.64	4.12	-27.09	3.02	23.26	4.00	20.38	1.75	5	BFO
43	-25.29	6.86	-5.76	2.03	20.01	5.76	6.88	2.62	8	FUR
44	-69.90	6.23	17.87	4.13	105.81	7.42	64.51	4.10	4	kar
45	0.37	7.57	-31.81	2.43	53.70	7.48	48.02	3.71	4	oet
46	-26.58	8.72	15.14	1.25	-25.18	5.22	-33.89	1.23	2	lin

Magnetic field components X, Y, Z and F with their standard deviations σ, * Number of used data points in time series.

Table S6: Repeat station lithospheric anomaly values with magnetospheric correction for Germany.

Nr	X [nT]	σX [nT]	Y [nT]	σY [nT]	Z [nT]	σZ [nT]	F [nT]	σF [nT]	*Nr. of data	Code
1	114.34	1.37	-99.08	1.82	108.91	1.20	141.77	1.68	3	lis
2	20.66	0.83	85.45	1.39	-27.82	1.30	-17.95	1.43	2	eis
3	107.67	2.30	48.19	1.47	98.26	2.63	130.68	2.83	3	alt
4	-5.13	2.08	-36.44	2.86	-54.21	3.90	-52.83	3.35	5	ban
5	48.44	1.04	-23.38	2.40	-116.96	3.42	-92.24	3.27	5	kan
6	113.19	0.40	-46.58	1.31	13.18	2.48	53.14	2.08	2	hel
7	83.48	0.33	77.82	0.49	64.06	0.64	90.99	0.67	2	bug
8	21.88	1.40	-63.43	1.52	-93.55	2.35	-79.98	2.08	5	kam
9	84.67	0.62	-5.66	0.25	131.61	1.93	153.36	1.57	2	bot
10	58.81	1.11	42.64	1.42	-79.60	1.96	-52.54	2.03	8	WNG
11	2.70	0.12	22.86	3.09	-20.25	2.14	-17.72	1.73	3	bor
12	118.87	0.72	27.53	0.93	-138.68	2.88	-84.93	2.59	4	kob
13	82.45	0.82	-30.34	2.38	-55.52	2.23	-21.38	2.23	4	goe
14	31.96	2.19	-22.17	3.05	-132.76	2.29	-111.81	1.77	4	tan
15	65.15	2.44	27.80	2.31	132.65	1.57	147.75	2.08	4	hop
16	-11.77	3.36	23.77	2.19	-70.04	2.05	-69.15	1.46	3	eml
17	1.68	1.07	-35.88	0.65	-79.32	3.01	-73.29	2.00	2	jeg
18	-10.03	1.23	6.89	2.18	-82.86	3.09	-80.51	2.80	4	lie
19	-16.83	0.56	-2.76	0.89	-88.32	2.11	-88.16	1.68	8	NGK
20	37.45	1.05	12.52	1.71	-43.19	3.05	-25.25	3.04	3	tel
21	-21.26	0.61	5.29	2.87	-64.74	2.66	-67.84	2.63	3	sch
22	5.80	2.64	7.65	1.97	-69.87	4.77	-62.06	4.51	3	kee
23	-10.22	0.11	14.11	0.24	-61.86	4.45	-60.82	4.08	3	cla
24	-24.35	1.33	19.92	1.15	-71.30	3.10	-74.89	2.56	4	gtt
25	-161.88	0.51	52.36	1.19	-31.80	1.51	-91.85	1.38	4	col
26	-74.22	0.80	-65.09	1.21	-11.93	2.44	-41.21	2.24	4	deu
27	58.34	1.61	-41.05	2.13	-22.29	1.97	2.28	1.88	4	die
28	-14.09	2.77	0.21	1.70	-72.42	4.71	-72.08	3.48	3	eub
29	0.73	0.73	18.97	2.75	125.59	2.91	115.46	2.57	4	gru
30	-21.58	2.39	21.11	2.62	-32.81	3.51	-38.63	4.11	4	obe
31	-43.61	1.59	-10.52	4.50	-72.65	2.50	-84.15	2.87	5	sos
32	-18.60	0.52	-22.93	2.47	-65.68	2.15	-67.84	1.78	5	eil
33	-21.96	1.37	-44.89	2.22	-44.18	3.24	-49.45	3.12	5	ebe
34	32.35	3.07	-90.11	1.46	16.88	3.91	28.72	4.33	5	rad
35	16.27	0.52	-8.75	2.24	-56.36	3.04	-44.80	2.84	5	won
36	28.27	1.01	-35.20	4.43	-1.62	4.51	10.38	3.84	4	nos
37	95.83	1.87	-24.95	4.11	75.11	2.66	108.33	2.99	5	mer
38	-7.47	1.15	-23.39	4.47	-46.47	1.96	-45.67	2.16	5	gai
39	-1.78	1.93	16.13	0.85	8.32	3.10	6.79	3.10	4	ber
40	-22.71	0.71	-21.02	1.30	-17.41	2.42	-25.80	2.54	3	poi
41	-7.37	1.46	-24.25	2.90	-8.97	2.85	-11.35	2.44	5	wit
42	11.92	1.37	-30.26	1.86	7.11	2.41	11.73	1.71	5	BFO
43	-10.44	0.85	-9.30	0.74	2.70	3.03	-2.27	2.67	8	FUR
44	-53.39	2.17	13.90	2.40	87.01	2.61	54.84	1.95	4	kar
45	16.66	2.24	-35.73	0.17	34.68	2.01	38.26	1.98	4	oet
46	-12.71	1.08	11.92	3.41	-41.17	3.68	-42.04	3.34	2	lin

Magnetic field components X, Y, Z and F with their standard deviations σ, $*$ Number of used data points in time series.

Table S7: Comparison of X and Y lithospheric anomaly estimates for Germany.

Data-X	R-SCHA-X	X-EMM-720	X-EMM-200	Data-Y	R-SCHA-Y	Y-EMM-720	Y-EMM-200	Code
114.3	67.1	126.1	51.8	-99.1	-58.2	-60.3	4.4	lis
20.7	9	25.7	48.2	85.5	79.2	82.5	-2.2	eis
107.7	-28.8	67	62.8	48.2	19.7	12.1	-23.6	alt
-5.1	71.6	45	55.4	-36.4	-88.6	-25.2	-26.7	ban
48.4	86.1	81	61.7	-23.4	33.6	-13.9	-32.9	kan
113.2	47.8	79.4	63.5	-46.6	-11.5	-1.7	-12.3	hel
83.5	11.2	63.7	67.3	77.8	67.6	36.4	-28.8	bug
21.9	41.9	44.1	69.4	-63.4	-36.5	-48.3	-22.5	kam
84.7	-13.5	66	57.4	-5.7	-10.4	-33.6	-41.7	bot
58.8	47.8	62.4	49.9	42.6	18.4	17	39.2	WNG
2.7	39.8	32.6	30.6	22.9	21.4	10.8	-5.7	bor
118.9	137.2	135.6	77.9	27.5	33.6	-6.2	-31.2	kob
82.5	95.8	75.3	47.4	-30.3	-23.2	-29.6	-51.6	goe
32	33	46.4	52.7	-22.2	10.3	-33.8	-43.3	tan
65.2	1.5	45.3	42.4	27.8	-4.6	-11.8	-24.7	hop
-11.8	28.1	18.3	37	23.8	43.7	47.6	28.7	eml
1.7	43.4	16.6	25.5	-35.9	-25.8	-23	-44	jeg
-10	-7.8	7.9	19	6.9	-13.6	-36.5	-55.2	lie
-16.8	-4.3	-8.8	-11	-2.8	3.1	-35.8	-23.2	NGK
37.5	30.7	25.3	-4.8	12.5	19.9	17.4	-11	tel
-21.3	-12.4	-7.4	-8.7	5.3	12.3	-1.6	-21.8	sch
5.8	-18.2	-9.5	-2.1	7.7	3.5	26.1	24.1	kee
-10.2	-17.3	-7.1	8.4	14.1	24.9	9.2	12.2	cla
-24.4	-14.7	1.1	-0.7	19.9	14.4	14.2	12.2	gtt
-161.9	-52.6	-39.1	-23.8	52.4	9.9	-28.4	-15.8	col
-74.2	-44.9	-47.7	-42.8	-65.1	-43.8	-53.2	-66	deu
58.3	-18.4	19.2	-5.3	-41.1	-15.9	-9	-17.4	die
-14.1	-11.5	2.9	-9	0.2	2.3	-9.3	-7.7	eub
0.7	-66.6	-13	-3.8	19	41.2	21.2	10.8	gru
-21.6	-36.2	-7.5	-15.3	21.1	14.2	-11.7	-15.4	obe
-43.6	-8.9	-29.4	-6.9	-10.5	10.9	58.9	13.5	sos
-18.6	-3.9	-5.8	3.9	-22.9	-21.4	-5.1	-12.6	eil
-22	-28.3	-8.7	-7	-44.9	-9.3	-19.7	-10.5	ebe
32.4	-47.7	24.1	-11.6	-90.1	-98.9	-61.9	-23.7	rad
16.3	19.3	7.1	2.7	-8.8	-4.5	-2.4	9.7	won
28.3	-22.8	21.8	17.9	-35.2	-11.4	1.4	-1.8	nos
95.8	-22.9	-1	-15.5	-25	-13.3	-34	-30.6	mer
-7.5	4.9	-2.4	-6	-23.4	-25.1	-5.9	-13.7	gai
-1.8	-45.2	-2.9	4	16.1	31.2	4.4	-18	ber
-22.7	-47	-4.3	-44.9	-21	8.4	1	-18.7	poi
-7.4	-8	13.2	18.3	-24.3	-16.4	-6.5	-14.9	wit
11.9	-12.9	14	15.3	-30.3	-16.4	-14.4	-6.7	BFO
-10.4	-27.4	-11.3	-12.2	-9.3	-7.4	-18.6	-5.9	FUR
-53.4	-109.7	-36.9	-2.4	13.9	12	10.9	14.1	kar
16.7	-49.8	10.5	12.3	-35.7	-31.7	-27.8	-16.2	oet
-12.7	-13.3	5.5	-7.8	11.9	0.5	8.1	5.5	lin

Magnetic field components X and Y from ground data (Data), regional model (R-SCHA) and global model (EMM) up to spherical harmonic degree and order 720 or 200, respectively.

Table S8: Comparison of Z and F lithospheric anomaly estimates for Germany

Data-Z	R-SCHA-Z	Z-EMM-720	Z-EMM-200	Data-F	δF	F-EMM-720	F-EMM-200	Code
108.9	231.1	153.4	80.0	141.8	191.7	187.6	93.1	lis
-27.8	21.1	17.1	75.1	-18.0	10.2	26.1	87.3	eis
98.3	77.2	53.9	-19.3	130.7	178.9	74.2	3.7	alt
-54.2	-42.6	11.7	39.5	-52.8	5.9	26.6	56.3	ban
-117.0	-73.2	-88.9	-0.7	-92.2	-52.7	-54.4	20.9	kan
13.2	51.9	51.0	-31.1	53.1	92.2	76.3	-6.1	hel
64.1	-1.6	-2.7	-57.7	91.0	109.6	21.1	-30.1	bug
-93.6	-52.3	-34.1	-14.5	-80.0	-41.0	-16.5	11.3	kam
131.6	115.7	74.5	0.1	153.4	155.1	93.0	20.6	bot
-79.6	-52.1	-54.4	-39.1	-52.5	-24.4	-27.6	-17.8	WNG
-20.3	-11.7	11.5	36.6	-17.7	20.3	22.8	45.3	bor
-138.7	9.0	-89.1	-95.5	-84.9	-36.0	-33.5	-61.0	kob
-55.5	22.1	-22.9	-10.8	-21.4	12.4	6.2	6.8	goe
-132.8	-103.7	-107.4	-44.8	-111.8	-66.5	-83.1	-22.9	tan
132.7	33.4	28.4	-62.3	147.8	152.6	43.0	-42.4	hop
-70.0	-80.2	-42.4	-7.0	-69.2	-45.9	-32.0	7.7	eml
-79.3	-47.8	-35.5	-30.6	-73.3	-40.2	-26.9	-19.2	jeg
-82.9	-72.0	-108.5	-142.5	-80.5	-30.7	-98.3	-125.8	lie
-88.3	-63.1	-48.5	-43.6	-88.2	-31.8	-48.8	-44.8	NGK
-43.2	9.5	-6.3	10.1	-25.3	-1.7	4.2	7.4	tel
-64.7	-59.0	-29.6	-25.4	-67.8	-32.3	-30.2	-27.1	sch
-69.9	-72.1	-51.6	-94.5	-62.1	-40.2	-51.1	-87.7	kee
-61.9	-71.6	-25.3	-35.6	-60.8	-46.2	-25.9	-29.4	cla
-71.3	-69.4	-54.4	-49.0	-74.9	-51.2	-49.4	-45.2	gtt
-31.8	-58.6	-7.2	-9.2	-91.9	19.1	-22.5	-18.1	col
-11.9	-49.2	-54.6	-37.1	-41.2	8.9	-69.9	-52.2	deu
-22.3	16.5	-19.3	-5.9	2.3	24.8	-10.3	-7.8	die
-72.4	-68.6	-67.7	-52.9	-72.1	-50.2	-61.0	-52.1	eub
125.6	38.1	36.3	-19.1	115.5	129.7	28.3	-18.9	gru
-32.8	-54.7	-42.5	-43.5	-38.6	-24.4	-42.0	-46.2	obe
-72.7	-33.1	-29.8	-11.3	-84.2	-31.7	-38.1	-12.9	sos
-65.7	-55.1	-39.7	-14.9	-67.8	-43.4	-38.7	-12.2	eil
-44.2	-21.8	12.2	7.8	-49.5	-25.5	7.4	4.2	ebe
16.9	29.8	33.5	21.0	28.7	48.5	40.2	14.3	rad
-56.4	-44.4	-27.9	-23.9	-44.8	-17.4	-22.5	-20.6	won
-1.6	-21.3	-14.4	-37.7	10.4	-1.0	-3.9	-26.7	nos
75.1	42.7	1.0	-7.5	108.3	115.2	0.1	-13.7	mer
-46.5	-42.9	-23.2	-31.0	-45.7	-22.0	-22.2	-30.9	gai
8.3	-5.1	9.4	-17.4	6.8	20.0	7.3	-14.1	ber
-17.4	0.3	-17.0	-16.6	-25.8	-18.6	-17.1	-34.6	poi
-9.0	-11.0	-16.7	7.3	-11.4	3.3	-9.3	14.4	wit
7.1	-24.2	-13.0	11.2	11.7	2.5	-5.7	16.6	BFO
2.7	-22.6	2.7	2.3	-2.3	-15.9	-2.8	-3.3	FUR
87.0	22.4	50.1	25.3	54.8	86.1	29.0	21.9	kar
34.7	40.9	9.8	-15.9	38.3	63.9	13.2	-8.9	oet
-41.2	-33.4	-17.6	-17.4	-42.0	-15.2	-13.2	-18.9	lin

Magnetic field components Z and F from ground data (Data), regional model (R-SCHA) or high resolution aeromagnetic map (δF) and global model (EMM) up to spherical harmonic degree and order 720 or 200, respectively.

S2 Supplemental figure
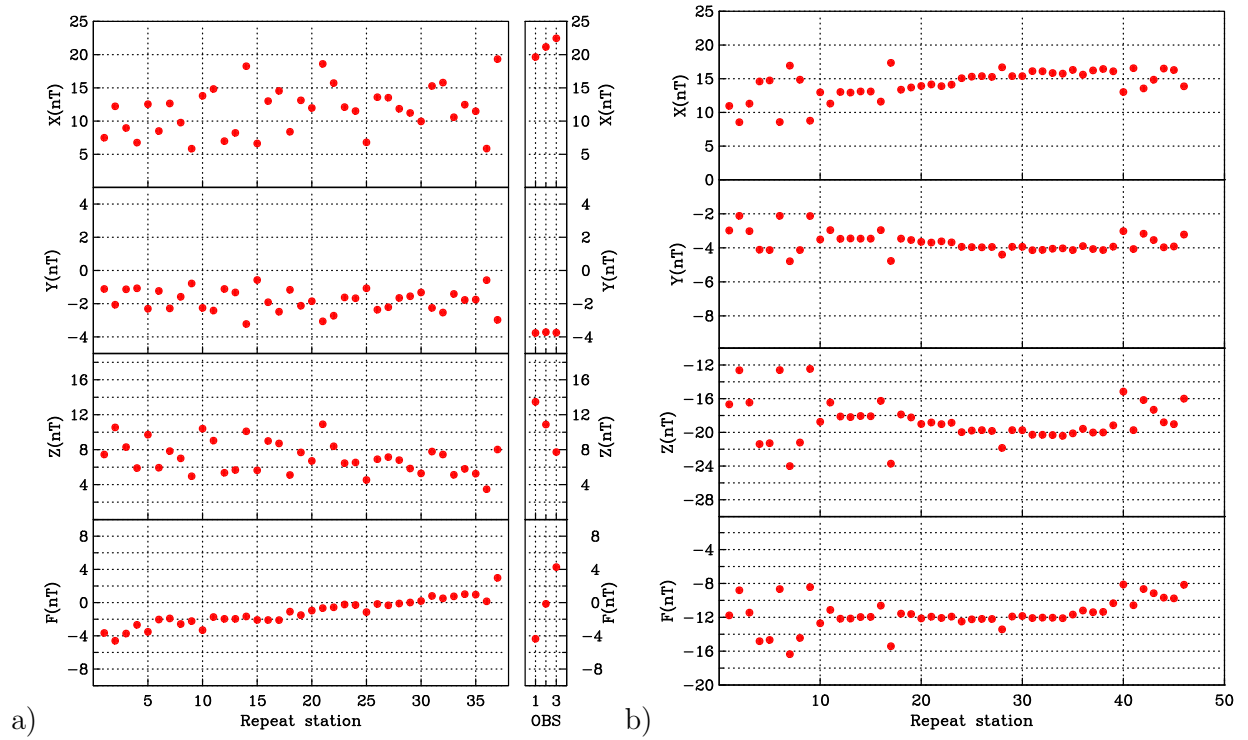
Figure S1: Differences between lithospheric anomaly estimates in the a) southern African region and b) Germany without and with consideration of magnetospheric field contributions as described by the GRIMM3 model. Stations as numbered in Tables S1 and S5 and orderd by decreasing geomagnetic latitude from left to right.