

Name	Network	Latitude (°N)	Longitude (°W)	Elevation (m)	Deployed
DDAL	CAM	65.07739	16.93341	801	2007-2011*
DYNG	CAM	65.05191	16.64809	957	summer 2007
FJAL	CAM	65.00945	17.03759	837	2008-2011
FLAT	CAM	65.18279	16.49796	728	2010-2011
FLUR	CAM	64.84354	17.02693	838	2010-2011
FREF	CAM	65.35190	16.28355	533	2007-2011*
HELI	CAM	65.19875	16.21843	491	2007-2011*
HERD	CAM	65.18157	16.39731	686	summer 2007
HETO	CAM	65.12872	16.31695	582	summer 2007
HOTT	CAM	65.04748	16.52985	718	2007-2011*
HRIM	CAM	64.89633	16.97921	849	2010-2011
HRUR	CAM	65.15577	16.67551	697	2010-2011
HRUT	CAM	65.15576	16.67443	701	summer 2007
JOAF	CAM	65.11055	16.24406	548	summer 2007
KOLL	CAM	65.29024	16.56726	593	2007-2011
LOKA	CAM	65.15699	16.82042	734	2007-2011
MIDF	CAM	65.08676	16.32961	572	2007-2011*
MOFO	CAM	64.98440	16.65119	702	2007-2011*
MYVO	CAM	65.15550	16.36895	639	2007-2011
RODG	CAM	64.98513	16.88639	1022	2007-2011
SVAD	CAM	65.11746	16.57498	680	2007-2011*
TOHR	CAM	64.91658	16.78473	715	2008-2011
TOLI	CAM	65.10336	16.11953	537	2010-2011
UTYR	CAM	65.03605	16.31867	623	2007-2011
VADA	CAM	64.99487	16.53817	673	2007-2011*
VEGG	CAM	65.38205	16.37467	507	2010-2011
VIBR	CAM	65.06619	16.73256	1110	2007-2009*
VIKR	CAM	65.07474	16.51347	718	2007-2009*
VISA	CAM	65.06901	16.40369	640	2007-2009*
ADA	SIL	65.01883	15.05745	443	2007-2011
BRU	SIL	64.82883	16.08850	751	2007-2011
HVA	SIL	64.95466	15.86933	703	2007-2011
KRE	SIL	64.78367	16.38283	760	2007-2011
MKO	SIL	64.97833	16.33833	690	2007-2011
VSH	SIL	64.80783	15.72767	860	2007-2011

Supplementary Table 1.

List of seismic stations active during separate portions of our study period (2007-2011). Asterisks indicate stations that were inactive during the winter of 2007-2008. CAM refers to the network run by Cambridge University and SIL refers to permanent stations run by the Icelandic Meteorological Office. Latitude and longitude assume the WGS84 geoid.

Depth (km)	V_P ($\frac{m}{s}$)	V_S ($\frac{m}{s}$)	Density ($\frac{kg}{m^3}$)
-1.2	2400	1364	2087
-0.7	2500	1420	2127
-0.4	3000	1705	2279
0.5	3700	2102	2399
1.5	4400	2500	2468
2.5	4900	2784	2586
3.5	5400	3068	2699
5.0	5700	3239	2757
8.0	6600	3750	2901
15.0	6700	3807	2935
25.0	7100	4034	3064
100.0	8000	4550	3308

Supplementary Table 2.

Values of seismic wave velocity and density with depth, used for hypocentre location and finite-element modelling. See also Fig. 3 in the main text.

Depth (km)	Left-Lateral Slip (cm)	Fault Opening (cm)
13.0	0	0
14.0	20	20
15.0	40	60
15.5	50	100
16.0	50	100
16.5	50	100
17.0	40	60
18.0	20	20
19.0	0	0

Supplementary Table 3.

Spatial database file used to impose initial displacements on the modelled dyke.

Displacements and dyke geometry are based on a combination of seismic and geodetic surveys of the Upptyppingar area during the intrusion (Hooper et al. 2011; White et al. 2011).

Name	Latitude (°N)	Longitude (°W)	East ($\frac{\text{mm}}{\text{a}}$)		North ($\frac{\text{mm}}{\text{a}}$)		Vertical ($\frac{\text{mm}}{\text{a}}$)
			Observed	Modelled	Observed	Modelled	Modelled
BRUJ	64.829	16.088	6.3	6.6	-23.3	-27.7	11.0
HEBL	65.180	16.210	0.7	-1.3	-7.4	-0.2	-1.1
KREP	65.100	16.171	-3.4	-0.4	-2.3	3.1	3.3
LIND	64.882	16.311	-1.0	-3.5	-22.7	-19.6	13.0
UPP3	64.995	16.256	-20.4	-3.9	-12.2	-9.4	32.0
VIKD	65.071	15.951	10.7	14.3	6.5	4.8	20.1
ALFD	64.984	16.034	27.6	26.1	-25.5	-25.6	52.6

Supplementary Table 4.

Observed and predicted surface displacements at the locations of seven GPS stations near to Mount Upptyppingar over the course of the dyke intrusion in the mid-crust. Observed displacements are reproduced from Hooper et al. 2011 for comparison with our modelled values. See also Fig. 8 in the main text.