

1 **Dike intrusions during rifting episodes obey scaling**
2 **relationships similar to earthquakes**

3

4 **Supplementary Information**

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11 **Data**

12 The volume and length datasets for the 1975-1984 Krafla rifting episode are based on published
13 records of individual ground deformation events. In Supplementary Table 1, we report volumes of
14 subsidence of the Krafla caldera from Tryggvason (1984)¹ and Arnadottir *et al.* (1998)². To obtain
15 the volumes of dike intrusions associated with these deflation events, we multiply the subsidence
16 volumes by two. The length dataset is based on digitization of Figure 2 in Buck *et al.* (2006)³. We
17 note that this figure includes one dike intrusion that is not discussed in the detailed chronology of
18 the rifting episode³. Correcting for this discrepancy (P. Einarsson personal communication, 2012),
19 we exclude the extra intrusion and use the onset times of dike intrusions reported by Tryggvason
20 (1984)¹.

21 Estimates of the dimensions of dike intrusions associated with the 2005-2010 Manda-Hararo
22 rifting episode are available from multiple sources. In Supplementary Table 2, we report the MHA
23 dataset, which contains estimates of volume and length, and the MHB dataset, which contains
24 estimates of volume, length and dislocated area. Volumes for the MHA dataset are from Ebinger
25 *et al.* (2010)⁴ and I. Hamling (personal communication, 2011), and the lengths are digitized from
26 Figure 2a in Wright *et al.* (2012)⁵. The MHB dataset is based on Table 1 and Figure 3 of Grandin
27 *et al.* (2010)⁶. For the first dike intrusion, we use the sum of values given for the d0a and d0b
28 dike segments since the northernmost part of the dike intrusion was likely sourced from magma
29 reservoirs that were not active during the remainder of the rifting episode⁶.

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32 episode. *Bulletin Volcanologique* **47**, 47–69 (1984).
- 33 2. Arnadóttir, T., Sigmundsson, F. & Delaney, P. T. Sources of crustal deformation associated with
34 the Krafla, Iceland, eruption of September 1984. *Geophys. Res. Lett* **25**, 1043–1046 (1998).
- 35 3. Buck, W., Einarsson, P. & Brandsdóttir, B. Tectonics stress and magma chamber size as controls
36 on dike propagation: constraints from the 1975-1984 Krafla rifting episode. *J. Geophys. Res.*
37 **111**, B12404 (2006).
- 38 4. Ebinger, C. *et al.* Length and timescales of rift faulting and magma intrusion: the Afar rifting
39 cycle from 2005 to present. *Annu. Rev. Earth Planet. Sci.* **38**, 439–466 (2010).
- 40 5. Wright, T.J. *et al.* Geophysical constraints on the dynamics of spreading centres from rifting
41 episodes on land. *Nature Geosci.* **5**, 242–250 (2012).
- 42 6. Grandin, R. *et al.* Sequence of rifting in Afar, Manda-Hararo rift, Ethiopia, 2005–2009: Time-
43 space evolution and interactions between dikes from interferometric synthetic aperture radar
44 and static stress change modeling. *J. Geophys. Res.* **115**, B10413 (2010).

Supplementary Table 1. Krafla data

¹multiplied by two in the analysis

Krafla			
Date	Time	Volume ¹	Length
	since first dike (days)	(10 ⁶ m ³)	(km)
20-Dec-1975	0	150	74
25-Sep-1976	280	10	1
31-Oct-1976	316	32	12
20-Jan-1977	397	21	6
28-Apr-1977	495	47	17
08-Sep-1977	628	20	14
02-Nov-1977	683	2	35
07-Jan-1978	749	74	25
10-Jul-1978	933	37	9
10-Nov-1978	1056	45	10
13-May-1979	1240	44	2
03-Dec-1979	1444	3	6
11-Feb-1980	1514	6	19
16-Mar-1980	1548	35	3
10-Jul-1980	1664	24	6
18-Oct-1980	1764	16	2
25-Dec-1980	1832	5	2
30-Jan-1981	1868	25	7
18-Nov-1981	2160	20	8
04-Sep-1984	3181	50	7

Supplementary Table 2. Manda-Hararo datasets

Date	Time since first dike (days)	MHA		MHB		
		Volume (10 ⁶ m ³)	Length (km)	Volume (10 ⁶ m ³)	Area (km ²)	Length (km)
04-Sep-2005	0	2000	76	1189	259.8	52
17-Jun-2006	286	120	10	129	118.9	14
25-Jul-2006	324	42	9	48	62.2	11
10-Sep-2006	371	88	12	53	98.4	13
07-Dec-2006	459	58	11	44	49.9	12
14-Jan-2007	497	37	7	37	72.5	14
11-Aug-2007	706	48	12	55	49.7	12
11-Nov-2007	798	150	28	186	242.9	23
31-Mar-2008	939	88	16	99	161.1	27
09-Jul-2008	1039	66	10	47	74.2	19
17-Oct-2008	1139	170	16	198	140	17
11-Feb-2009	1256	77	10	73	83.5	12
29-Jun-2009	1394	46	13	44	46.6	12
15-May-2010	1714	80	8			