Title	Tremor-rich shallow dyke formation followed by silent magma flow at Bárðarbunga in Iceland
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Publication date	2017-04
Publication information	Eibl, Eva P. S., Christopher J. Bean, Kristín Vogfjörð, Yingzi Ying, Ivan Lokmer, Martin Möllhoff, G. S. O'Brien, and Finur Pálsson. "Tremor-Rich Shallow Dyke Formation Followed by Silent Magma Flow at Bárðarbunga in Iceland" 10 (April, 2017).
Publisher	Nature
Item record/more information	http://hdl.handle.net/10197/8740
Publisher's version (DOI)	10.1038/NGEO2906

Supporting Information for

Tremor-rich shallow dyke formation followed by silent magma flow at Bárdarbunga in Iceland

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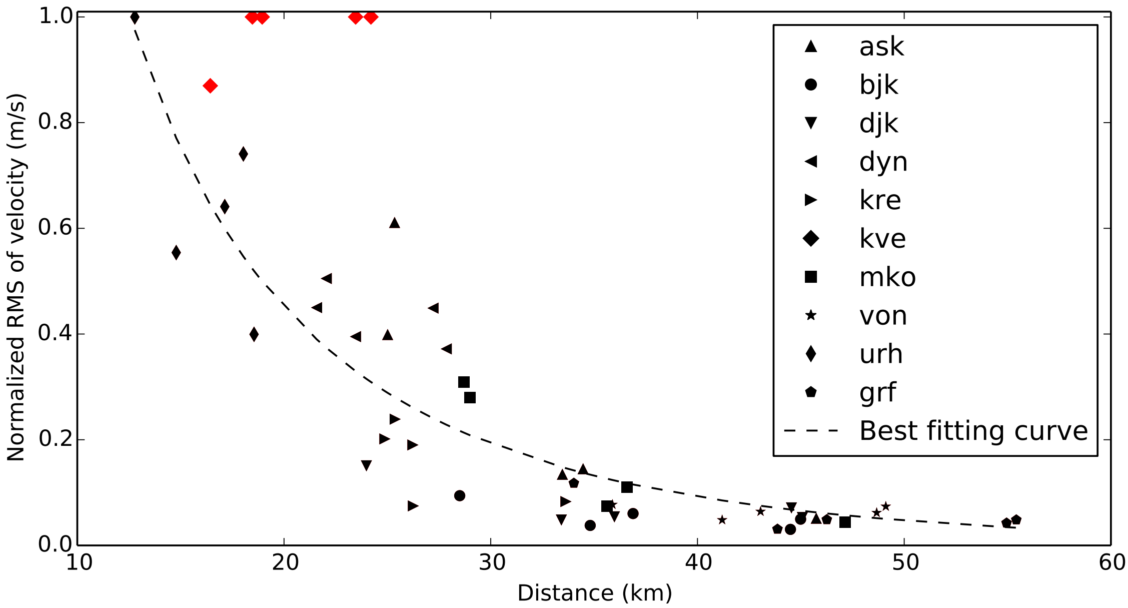

Figure 1: **Derivation of site correction factors.** Root Mean Square (RMS) seismic amplitude at Icelandic Met Office (IMO) stations vs. hypocentral source-receiver distance of five well located events beneath the cauldrons C1 to C3. Data were filtered between 3 and 4 Hz. Red points are discarded due to a clear deviation from the expected behaviour. The remaining points are fit assuming body wave decay of the amplitude with distance. For each point site correction factors are derived with respect to the curve and the median is found for each station.

Freq. band	ask	bjk	djk	dyn	kre	kve	mko	von	urh	grf	Q β (km/s)
3-4 Hz	1.0569	0.8932	0.9552	1.3502	0.6904	2.0011	0.9371	0.8554	1.0256	0.8295	246

Table 1: Site correction factors derived in the 3-4 Hz frequency band for events beneath the cauldrons and in the dyke.

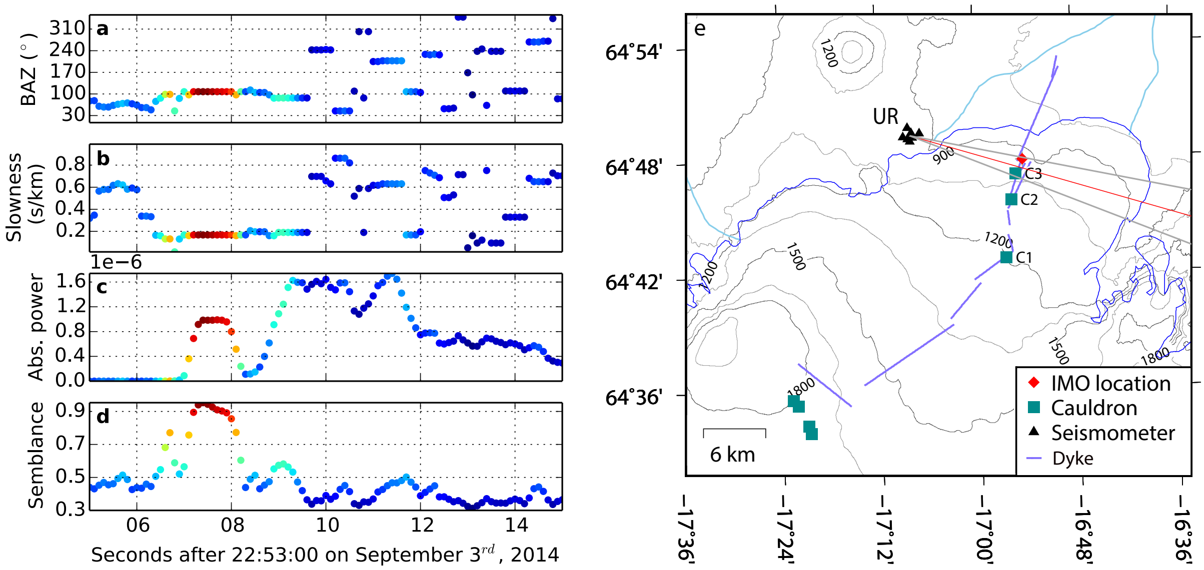

Figure 2: **Azimuthal precision check of the array.** Magnitude 2.5 event located 1.4 km north of C3 at 7 km depth on September 3^{rd}, 2014 by IMO. (a-d) The output of the FK analysis ((a) back azimuth, (b) slowness, (c) absolute power and (d) semblance) coloured according to semblance, increasing from 0.31 (blue) to 0.95 (red) is shown for UR. Typical slownesses associated with body and surface waves of an earthquake in the dyke can be seen. (e) Projected back azimuth of the P wave. The red diamond indicates the relative relocation using the IMO stations, which is within the error limits of the back azimuth from UR. Elevation in m a.s.l., based on data from the National Land Survey of Iceland.

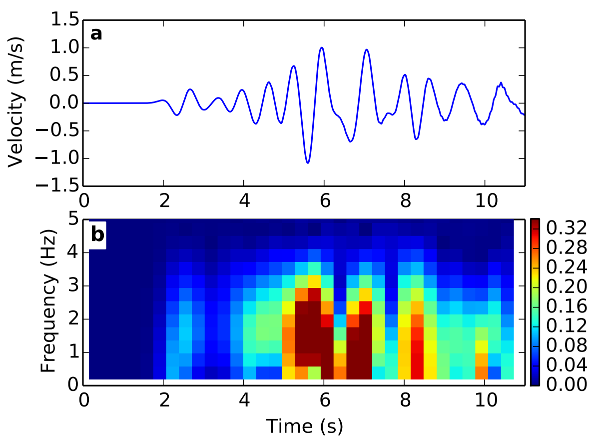

Figure 3: **Simulated event from a source at 3 km depth.** (a) Normalised vertical component synthetic seismogram at UR array at 12 km distance (the source is a 1 Hz Ricker wavelet) and (b) Amplitude spectrogram with a fast Fourier transform window length of 0.5 s and 50% overlap.

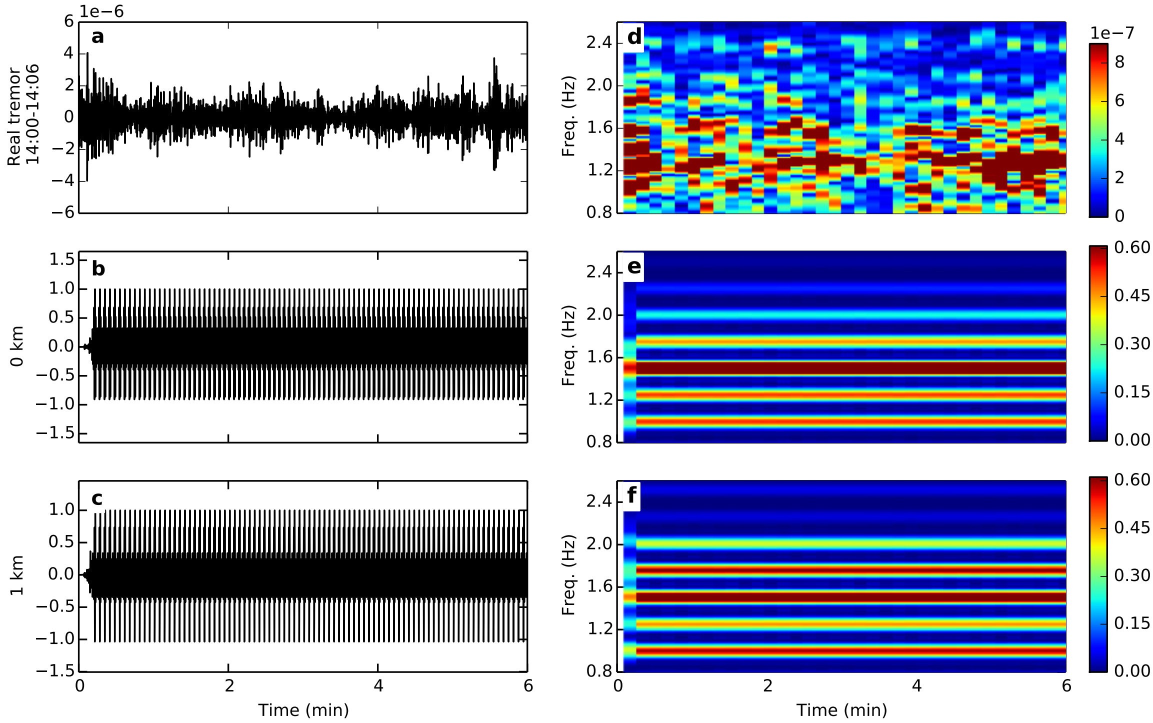

Figure 4: **Comparison of real and synthetic tremor simulated with a perfectly regular comb function.** Subfigures as in figure 4 but for tremor simulated by convolving the synthetic seismogram with a perfectly regular comb function and a regular amplitude distribution. All spectrograms are made with a fast Fourier transform window length of 16 s.

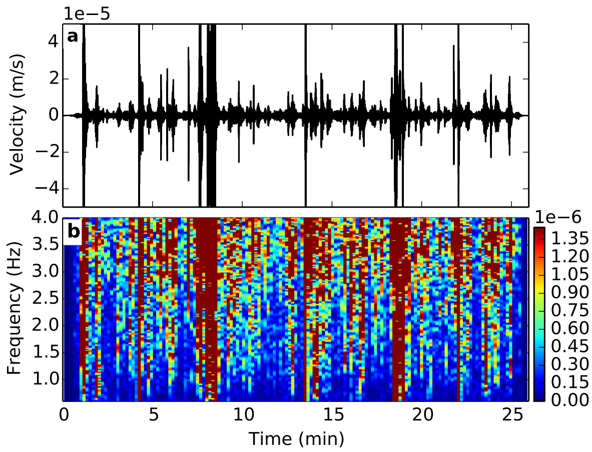

Figure 5: **Seismic recording at DY3 (see inset in figure 3a) directly on top of the dyke on August 30th, 2014.** (a) Seismogram and (b) Amplitude spectrogram with a fast Fourier transform window length of 16 s from DY3 at 64.83967 N and 16.874640 W filtered between 0.6 and 4 Hz shows no indication of a continuous tremor signal.

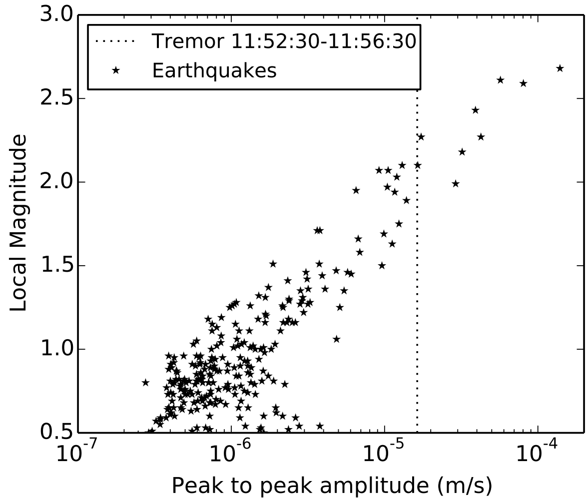

Figure 6: **Magnitude estimation of the largest 'single events' in the tremor.** Stars relate peak to peak amplitudes at UR with magnitudes from the IMO earthquake catalogue for 260 events beneath cauldrons C1 to C3 filtered between 1 and 5 Hz. As the tremor seems to be composed of swarms of individual events we estimated peak to peak amplitude during a 4 minute long time window at the time of maximum tremor amplitude (dotted line) visually ensuring that the maximum tremor amplitude does not correspond to dyke earthquakes. The largest individual event corresponds to a magnitude 2 earthquake.

Parameter	Parameter range				Ref.	Parameter values in reference
Rock stiffness (GPa)	0.05	0.5	5	50	4	0.05-4
Length (km)	1	5	10	40	10	dyke segments are 1.1-10.0 km long
Width (m)	1	5	10	20	10	rms of the EQ is 58-201 m
"	"	"	"	"	22	radius of flow path of 4.7
Fluid density (kg/m^3)	2000	2750	3000	-	22	2750
Viscosity (Pa s)	15	20	25	30	22	22
Flow velocity (m/s)	5	10	15	-	22	3.7, based on increased earthquake rate in dyke after caldera events

Table 2: Parameters for the tremor simulation in the model of Julian[4] constrained by field measurements.