

Supplementary file for article in Surtsey Research nr 15:

## Human (boot) tracks preserved in volcanic deposits of Surtsey Island, Iceland

RAÚL ESPERANTE<sup>1</sup>, BIRGIR VILHELM ÓSKARSSON<sup>2</sup>

<sup>1</sup>Geoscience Research Institute, Loma Linda University, California, 92350, USA, resperante@llu.edu (corresponding author)

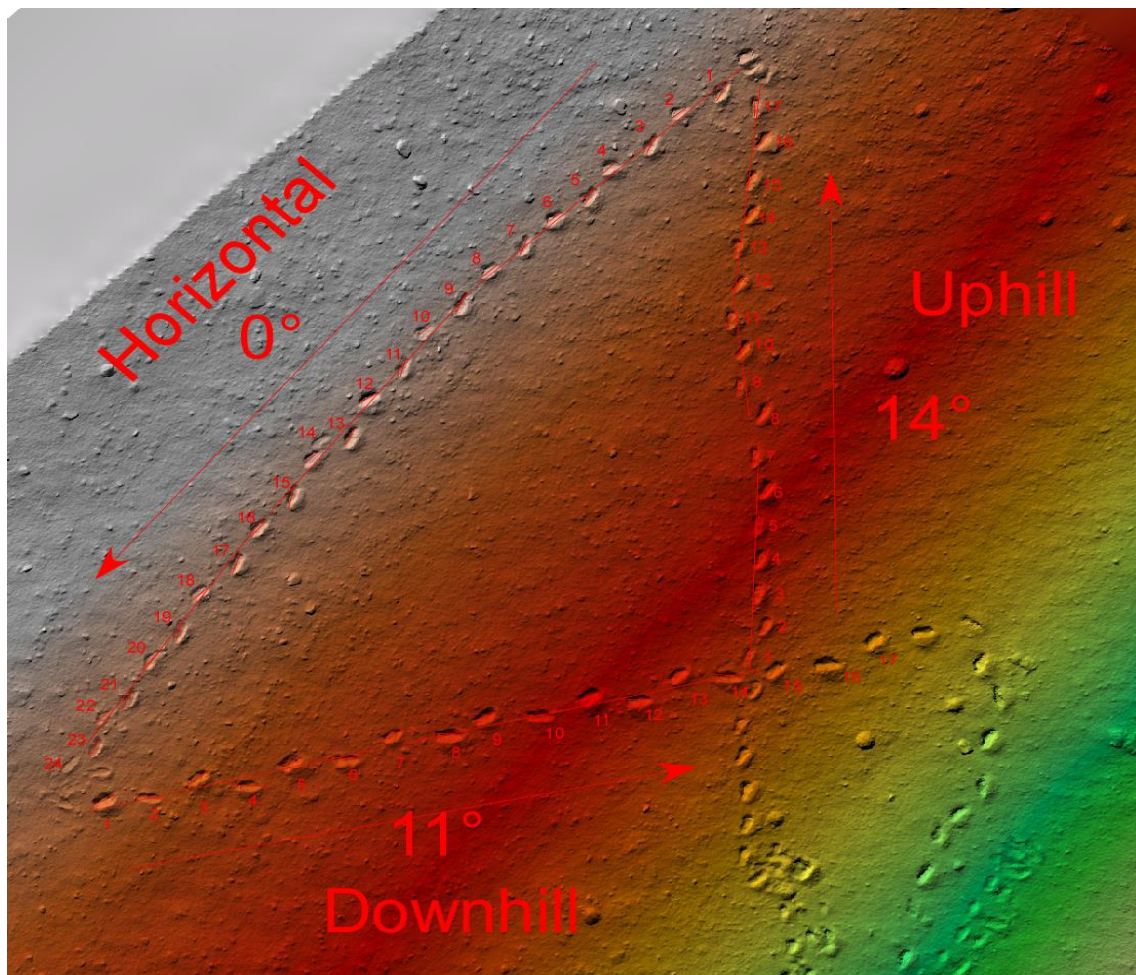
<sup>2</sup>Icelandic Institute of Natural History, Urriðaholtstræti 6–8, 210 Garðabær, Iceland

Trackways made in sand on Surtsey for comparison with the trackways studied. The tracks are deformed in the sand, and the true size of the boot tracks in the experiment and in the study sites could be found by assessing the following:

- 1 - Finding the deformation factor. Shape of tracks (length vs width) divided by the shape of original boot sizes (length vs width in box below).
- 2 - The deformation factor of 2.0 is used to find the true size of the tracks on the study sites (approximation only, number in between 1.9 from the uphill experiment and 2.6 from the downhill experiment).

Box 1. Original sizes of boots.				
<i>nr (EU)</i>	<i>Length (cm)</i>	<i>Width (cm)</i>	<i>Foot index</i>	<i>Length vs width</i>
46	32.5	11	0.34	<b>357.5</b>
42	26.7	9	0.34	<b>240.3</b>

DEM of Experiment site. See location in Fig. 1 in the article.



Tables showing the measurements summarized in Table 2 in the article.

Site E Experiment site											
Trackway 1 Uphill	Measurement	Length (cm)	Toe width (cm)	Heel width (cm)	Foot index	Length vs width	Pace (m)	Stride (m)	Trackway direction (deg)	Angle of gait (deg)	Foot
1	Photogrammetry	34.0	18.5	13.5	0.54	629.0	0.68	1.29	2.08	21.88	Right
2	Photogrammetry	37.7	17.8	11.7	0.47	671.1	0.63	1.33	2.08	25.82	Left
3	Photogrammetry	37.6	18.6	12.0	0.49	699.4	0.69	1.39	2.08	10.55	Right
4	Photogrammetry	38.7	18.2	13.0	0.47	704.3	0.69	1.42	2.08	23.22	Left
5	Photogrammetry	38.5	16.0	12.6	0.42	616.0	0.73	1.34	2.08	6.05	Right
6	Photogrammetry	38.5	19.2	14.9	0.50	739.2	0.65	1.54	2.08	29.21	Left
7	Photogrammetry	38.5	16.0	11.2	0.42	616.0	0.92	1.41	2.08	2.01	Right
8	Photogrammetry						0.56	1.31	353.49	29.94	Left
9	Photogrammetry	38.1	15.3	11.5			0.77	1.40	353.49	8.80	Right
10	Photogrammetry						0.64	1.28	353.49	41.59	Left
11	Photogrammetry						0.69	1.36	353.49	11.28	Right
12	Photogrammetry						0.70	1.46	6.36	30.51	Left
13	Photogrammetry						0.72	1.43	6.36	1.31	Right
14	Photogrammetry						0.65	1.50	6.36	29.30	Left
15	Photogrammetry						0.85	1.44	6.36	18.89	Right
16	Photogrammetry						0.62	1.26	6.36	28.72	Left
17	Photogrammetry						0.68		6.36	-7.35	Right Uphill
<b>Avg</b>		<b>37.7</b>	<b>17.5</b>	<b>12.6</b>	<b>0.47</b>	<b>667.9</b>	<b>0.70</b>	<b>1.38</b>	<b>86.27</b>	<b>18.34</b>	Size of tracks larger by factor of 1.9
<b>StDev</b>		1.55	1.46	1.23	0.05	48.84	0.09	0.08	152.80	13.30	see 1

Trackway 2 Horizontal	Measurement	Length (cm)	Toe width (cm)	Heel width (cm)	Foot index	Length vs width	Pace (m)	Stride (m)	Trackway direction (deg)	Angle of gait (deg)	Foot
1	Photogrammetry	41.2	17.9	14.1	0.43	737.5	0.75	1.64	227.48	-19.58	Left
2	Photogrammetry	35.2	20.5	11.0	0.58	721.6	0.85	1.65	227.48	5.18	Right
3	Photogrammetry	40.9	21.0	11.7	0.51	858.9	0.84	1.66	227.48	-23.90	Left
4	Photogrammetry	35.7	22.9	14.4	0.64	817.5	0.89	1.51	227.48	-2.48	Right
5	Photogrammetry	38.6	16.7	15.4	0.43	644.6	0.64	1.41	227.48	-18.12	Left
6	Photogrammetry	36.5	23.5	14.5	0.64	857.8	0.77	1.54	227.48	3.49	Right
7	Photogrammetry	39.2	21.6	14.7	0.55	846.7	0.74	1.55	227.48	-28.34	Left
8	Photogrammetry						0.81	1.60	227.48	1.24	Right
9	Photogrammetry						0.82	1.65	219.14	-14.99	Left
10	Photogrammetry						0.83	1.68	219.14	8.28	Right
11	Photogrammetry						0.84	1.69	219.14	-24.34	Left
12	Photogrammetry						0.87	1.64	219.14	17.72	Right
13	Photogrammetry						0.82	1.53	219.14	-13.54	Left
14	Photogrammetry						0.49	1.58	219.14	7.29	Right
15	Photogrammetry						0.89	1.75	219.14	-26.14	Left
16	Photogrammetry						0.91	1.69	215.05	6.05	Right
17	Photogrammetry						0.84	1.65	215.05	-15.80	Left
18	Photogrammetry						0.88	1.71	215.05	12.19	Right
19	Photogrammetry						0.82	1.51	215.05	-21.01	Left
20	Photogrammetry						0.66	1.63	215.05	4.01	Right
21	Photogrammetry						0.95	1.25	215.05	-8.05	Left
22	Photogrammetry						0.58	1.17	215.05	10.70	Right
23	Photogrammetry						0.61	1.25	215.05	-8.90	Left
24	Photogrammetry						0.50				Horizontal
<b>Avg</b>		<b>38.2</b>	<b>20.6</b>	<b>13.7</b>	<b>0.54</b>	<b>783.5</b>	<b>0.77</b>	<b>1.56</b>	<b>220.61</b>	<b>-6.48</b>	Size of tracks larger by factor of 2.2
<b>StDev</b>		2.44	2.50	1.66	0.09	83.26	0.13	0.16	5.39	14.20	see 1

<i>Trackway 3 Downhill</i>		<i>Measurement</i>	<i>Length (cm)</i>	<i>Toe width (cm)</i>	<i>Heel width (cm)</i>	<i>Foot index</i>	<i>Length vs width</i>	<i>Pace (m)</i>	<i>Stride (m)</i>	<i>Trackway direction (deg)</i>	<i>Angle of gait (deg)</i>	<i>Foot</i>
1	Photogrammetry	38.7	26.1	22.5	0.67	1010.1	0.81	1.81	76.46	-12.68	Left	
2	Photogrammetry	40.2	16.4	12.5	0.41	659.3	0.96	1.65	76.46	22.52	Right	
3	Photogrammetry	39.5	21.2	16.5	0.54	837.4	0.89	1.82	76.46	-24.20	Left	
4	Photogrammetry	44.3	18.8		0.42	832.8	0.83	1.92	76.46	18.03	Right	
5	Photogrammetry	42.2	24.8	17.6	0.59	1046.6	1.00	1.85	76.46	-11.23	Left	
6	Photogrammetry										Right	
7	Photogrammetry	38.6	19.8		0.51	764.3	0.95	1.68	76.46	-15.77	Left	
8	Photogrammetry	38.6	21.8		0.56	841.5	0.94	1.71	77.02	16.79	Right	
9	Photogrammetry	45.9	25.5		0.56	1170.5	0.74	1.92	77.02	-12.49	Left	
10	Photogrammetry	43.7	26.5		0.61	1158.1	0.99	1.81	77.02	16.60	Right	
11	Photogrammetry	48.1	22.5	17.9	0.47	1082.3	0.98	1.67	77.02	-9.75	Left	
12	Photogrammetry						0.87	1.68	77.02	12.26	Right	
13	Photogrammetry						0.85	1.75	77.02	-20.16	Left	
14	Photogrammetry						0.80	1.79	77.02	19.09	Right	
15	Photogrammetry						0.93	1.90				
16	Photogrammetry						0.89	1.88				
17	Photogrammetry						1.02	1.81				
18	Photogrammetry						0.85				Downhill	
<b>Avg</b>		<b>42.0</b>	<b>22.3</b>	<b>17.4</b>	<b>0.53</b>	<b>940.3</b>	<b>0.90</b>	<b>1.79</b>	<b>76.76</b>	<b>-0.08</b>	Size of tracks larger by factor of	2.6
<b>StDev</b>		3.40	3.39	3.57	0.08	175.93	0.08	0.09	0.29	17.52		see 1

Sites studied

**Site 1**

<i>Trackway 1</i>		<i>Measurement</i>	<i>Length (cm)</i>	<i>Toe width (cm)</i>	<i>Heel width (cm)</i>	<i>Foot index</i>	<i>Length vs width</i>	<i>Pace (m)</i>	<i>Stride (m)</i>	<i>Trackway direction (deg)</i>	<i>Angle of gait (deg)</i>	<i>Foot</i>
T1t1r	In situ	43.0	22.0		0.51	946.0	0.48	1.20	333.44	37.52	Right	
T1t2l	In situ	48.0	22.0		0.46	1056.0	0.73	1.47	333.44	25.79	Left	
T1t3r	In situ	32.0	15.0		0.47	480.0	0.78	1.39	333.44	-0.38	Right	
T1t4l	Photogrammetry						0.63	1.27	333.44	20.23	Left	
T1t5r	Photogrammetry						0.66	1.45	333.44	25.63	Right	
T1t6l	Photogrammetry						0.81	1.40	333.44	47.29	Left	
T1t7r	Photogrammetry						0.60		333.44	48.77	Right	
T1t8l	Photogrammetry								<b>333.44</b>	38.73	Left	
<b>Avg</b>		<b>41.0</b>	<b>19.7</b>		<b>0.48</b>	<b>827.3</b>	<b>0.67</b>	<b>1.36</b>	<b>333.44</b>	<b>30.45</b>	Uphill Length vs width divided by 2	<b>413.7</b>
<b>StDev</b>		8.19	4.04		0.03	305.79	0.11	0.11	0.00	16.20	close to nr 46	see 2

<i>Trackway 2</i>		<i>Measurement</i>	<i>Length (cm)</i>	<i>Toe width (cm)</i>	<i>Heel width (cm)</i>	<i>Foot index</i>	<i>Length vs width</i>	<i>Pace (m)</i>	<i>Stride (m)</i>	<i>Trackway direction (deg)</i>	<i>Angle of gait (deg)</i>	<i>Foot</i>	
T2t1r	Photogrammetry	36.3	15.3	12.2	0.42	555.4				27.672	0.062	Right	
T2t2l	Photogrammetry	32.5	15.6	14.0	0.48	507.0	0.82			27.672	1.496	Left Uphill	
<b>Avg</b>		<b>34.4</b>	<b>15.5</b>	<b>13.1</b>	<b>0.45</b>	<b>531.2</b>	<b>0.8</b>			<b>27.7</b>	<b>0.8</b>	Length vs width divided by 2	<b>265.6</b>
<b>StDev</b>		2.69	0.21	1.27	0.04	34.22				0.00	1.01	close to nr 42	see 2

**Site 2**

<i>Trackway 1</i>	<i>Measurement</i>	<i>Length (cm)</i>	<i>Toe width (cm)</i>	<i>Heel width (cm)</i>	<i>Foot index</i>	<i>Length vs width</i>	<i>Pace (m)</i>	<i>Stride (m)</i>	<i>Trackway direction (deg)</i>	<i>Angle of gait (deg)</i>	<i>Foot</i>	
T1t1r	In situ	31.0					0.80	1.44	22.40	0.25	Right	
T1t2l	In situ	31.0	16.0		0.52	496.0	0.75	1.53	22.40	-4.50	Left	
T1t3r	Photogrammetry						0.75	1.44	22.40	1.30	Right	
T1t4l	In situ	33.0	16.0		0.48	528.0	0.71	1.32	27.74	-17.48	Left	
T1t5r	Photogrammetry						0.75	1.56	27.74	-0.77	Right	
T1t6l	Photogrammetry						0.83	1.62	20.13	-15.76	Left	
T1t7r	Photogrammetry						0.82		20.13	10.16	Right	
T1t8l	In situ	34.0	19.0		0.56	646.0	0.86	1.67	20.13	-6.28	Left	
T1t9r	Photogrammetry								15.31	-4.00	Right	
T1t10l	Photogrammetry						0.86		15.31	12.38	Left	
T1t11r	Photogrammetry								15.31	0.52	Right	
Shallow slope												
<b>Avg</b>		<b>32.3</b>	<b>17.0</b>		<b>0.52</b>	<b>556.7</b>	<b>0.79</b>	<b>1.51</b>	<b>20.82</b>	<b>-2.20</b>	Length vs width divided by 2	<b>278.3</b>
<b>StdDev</b>		1.50	1.73		0.04	79.00	0.05	0.12	4.42	9.14	close to nr 42	see 2

<i>Trackway 2</i>	<i>Measurement</i>	<i>Length (cm)</i>	<i>Toe width (cm)</i>	<i>Heel width (cm)</i>	<i>Foot index</i>	<i>Length vs width</i>	<i>Pace (m)</i>	<i>Stride (m)</i>	<i>Trackway direction (deg)</i>	<i>Angle of gait (deg)</i>	<i>Foot</i>	
T2t1l	Photogrammetry						0.76		21.64	-12.97	Left	
T2t2r	Photogrammetry							1.57	21.64	-4.40	Right	
T2t4l	Photogrammetry								21.64	0.68	Left	
T2t8r											Right	
T2t10r											Right	
T2t15l	Photogrammetry	30.0	15.1		0.50	453.0	0.83	1.57	19.38	-1.81	Left	
T2t16r	Photogrammetry	40.9	14.0		0.34	572.6	0.86	1.58	19.38	0.23	Right	
T2t17l	Photogrammetry				0.44	753.5	0.80		19.38	2.16	Left	
T2t18r	Photogrammetry	41.4	18.2				0.85	1.71	19.38	0.66	Right	
T2t19l	Photogrammetry				0.40	571.5	0.92	1.78	29.36	1.22	Left	
T2t20r	Photogrammetry	37.6	15.2		0.50	954.8	0.82	1.49	29.36	-3.76	Right	
T2t21l	Photogrammetry	43.6	21.9						29.36	0.57	Left	
Shallow slope												
<b>Avg</b>		<b>38.7</b>	<b>16.9</b>		<b>0.44</b>	<b>661.1</b>	<b>0.83</b>	<b>1.62</b>	<b>23.05</b>	<b>-1.74</b>	Length vs width divided by 2	<b>330.5</b>
<b>StdDev</b>		5.32	3.21		0.07	196.20	0.05	0.11	4.46	4.50	close to nr 46	see 2

<i>Trackway 3</i>	<i>Measurement</i>	<i>Length (cm)</i>	<i>Toe width (cm)</i>	<i>Heel width (cm)</i>	<i>Foot index</i>	<i>Length vs width</i>	<i>Pace (m)</i>	<i>Stride (m)</i>	<i>Trackway direction (deg)</i>	<i>Angle of gait (deg)</i>	<i>Foot</i>	
T3t1l	Photogrammetry	30.9	10.4		0.34	321.4	0.67		21.53	-0.49	Left	
T3t2r	Photogrammetry	30.5	12.0		0.39	366.0			21.53	0.10	Right	
<b>Avg</b>		<b>30.7</b>	<b>11.2</b>		<b>0.37</b>	<b>343.7</b>	<b>0.7</b>		<b>21.5</b>	<b>-0.2</b>	Length vs width divided by 2	<b>171.8</b>
<b>StdDev</b>		0.28	1.13		0.04	31.57			0.00	0.42	close to nr 40	