

Statistics of earthquakes in Bárðarbunga

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November 2014

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Background

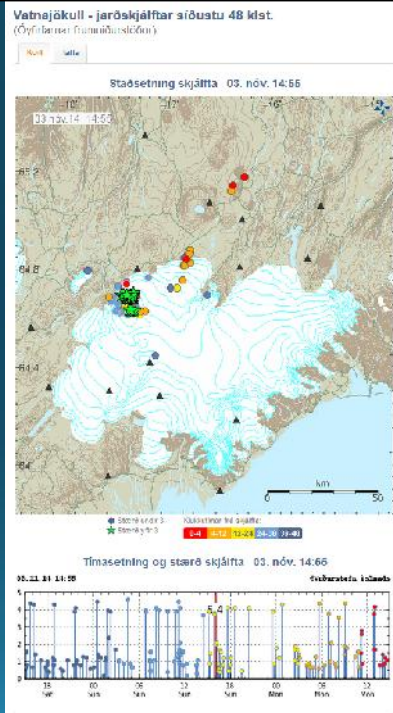
- Slides are from a presentation 4th November 2014 in Seminar on current geological events Tuesdays at 12-13, Unisversity of Iceland.
- Data used is from IMO, “skjálftavefsjá”.
- Note that there can be human errors in the data, as from discrepancy of examination at IMO or errors in the Matlab program used for the data analysis described here.
- Note that in some instances distribution is very likely dependent on capability of the measurement equipment used.
- Also note that some of the changes in earthquake pattern might be described with change of measurements in the area of Bárðarbunga in the time period from August to October 2014.

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The distribution of magnitude

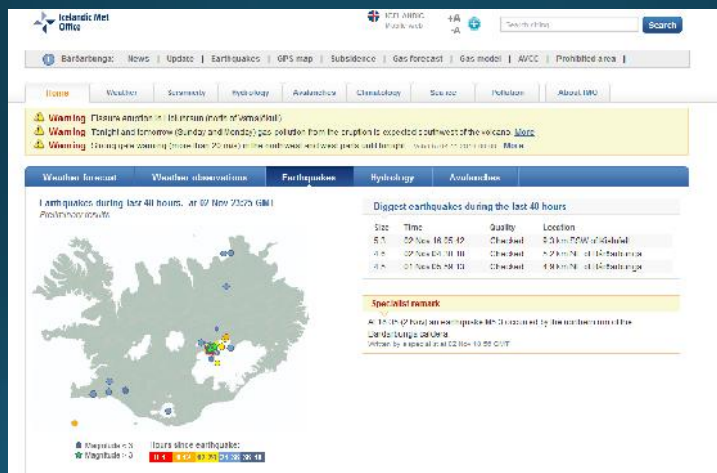
- There seems to be double distribution.
 - Small earthquakes in magnitude below 2.
 - Larger earthquakes in magnitude around 4 to 5.
- My shoulder broken in August and some single hand programming from that time improved now.

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The data used is from IMO

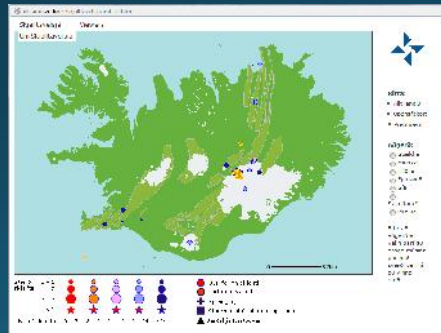
(Veðurstofa Íslands)



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"Skjálftavefsjá"

- Skjálftavefsjá from IMO used.
- All earthquakes in the area from magnitude zero.
- Time period: August to October 2014.

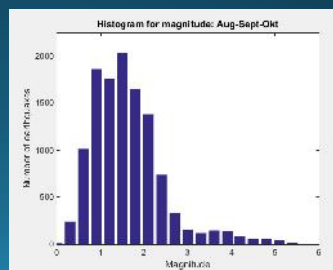
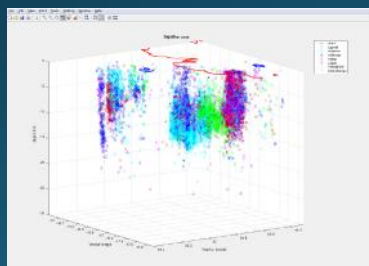
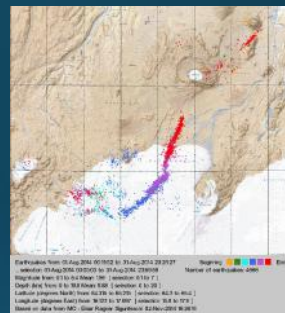


Dagur	Heiti	Staðir	Stærð	Þéttleiki	Gerð
2014-11-07 16:19:33	-17.405	64.013	0.6	1.1	auto
2014-11-07 16:19:37	-17.425	64.023	0.5	0.6	auto
2014-11-07 16:19:12	-17.412	64.023	0.9	1.1	auto
2014-11-07 16:19:35	-17.405	64.023	2.1	1.1	auto
2014-11-07 16:03:38	-17.332	64.097	1.7	1.1	auto
2014-11-07 16:03:51	-17.402	64.084	2.0	1.1	auto
2014-11-07 15:31:05	-17.405	64.070	0.9	1.1	auto
2014-11-07 15:31:31	-17.477	64.099	1.5	2.5	auto
2014-11-07 15:12:38	-17.500	64.067	0.9	1.1	auto
2014-11-07 15:12:05	-17.400	64.069	1.1	3.3	auto
2014-11-07 14:51:05	-17.36	64.059	1.6	1.1	auto
2014-11-07 13:49:33	-17.424	64.077	1.1	1.1	auto
2014-11-07 13:34:42	-17.588	64.073	0.3	3.0	auto
2014-11-07 13:32:07	-17.587	64.073	0.8	0.2	auto
2014-11-07 12:12:04	-17.425	64.053	0.9	0.2	auto
2014-11-07 12:10:32	-17.583	64.070	0.2	3.9	auto
2014-11-07 11:45:07	-17.434	64.083	1.6	1.1	auto
2014-11-07 11:43:15	-17.510	64.059	0.8	3.7	auto
2014-11-07 11:33:01	-16.842	64.858	1.8	13.	epi
2014-11-07 11:30:34	-17.433	64.060	0.1	1.6	epi
2014-11-07 11:12:12	-17.47	64.077	0.5	2.2	epi
2014-11-07 08:12:13	-17.481	64.077	0.1	5.1	epi
2014-11-07 07:39:33	-17.504	64.210	1.0	7.1	epi
2014-11-07 06:33:34	-17.513	64.083	3.9	7.7	epi
2014-11-07 06:33:02	-17.488	64.083	0.0	0.9	epi
2014-11-07 06:33:18	-17.402	64.079	0.6	7.0	epi
2014-11-07 02:32:33	-17.214	64.433	1.7	1.7	epi
2014-11-07 01:36:30	-19.265	64.207	1.1	0.1	epi
2014-11-07 00:39:05	-16.505	64.825	1.3	14.4	epi
2014-11-07 00:37:03	-17.404	64.077	0.5	3.5	epi
2014-11-01 22:11:35	-16.888	64.833	0.9	13.7	epi

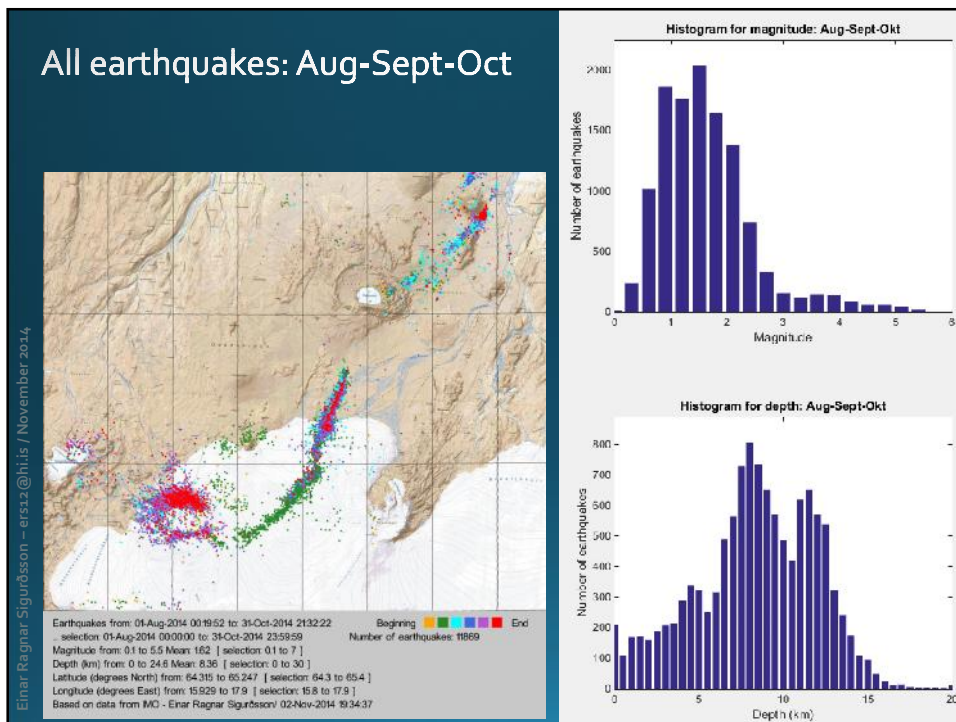
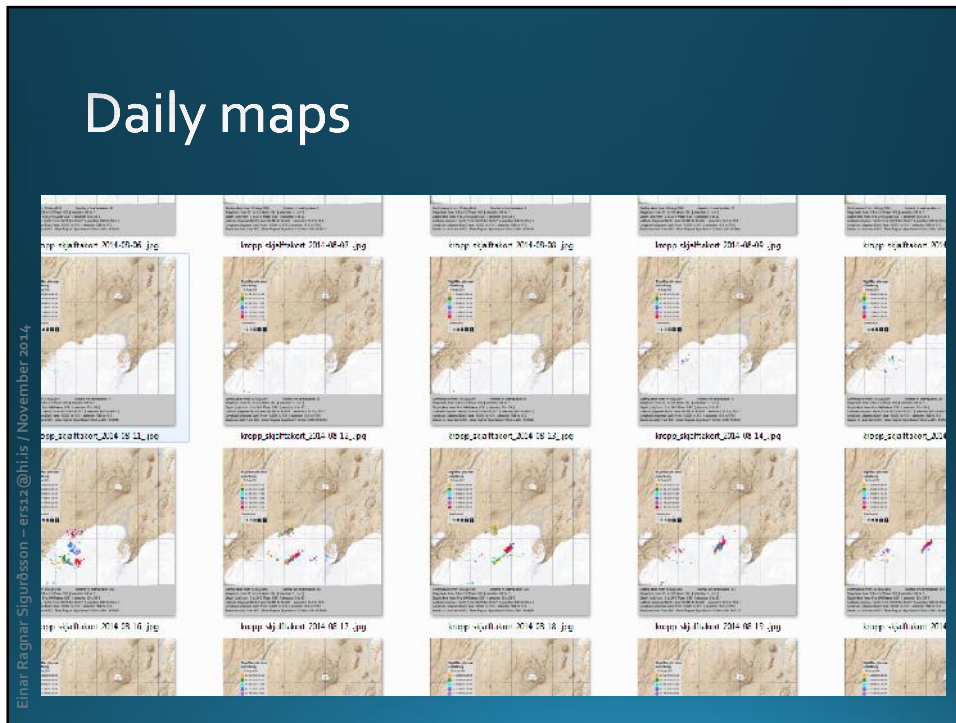
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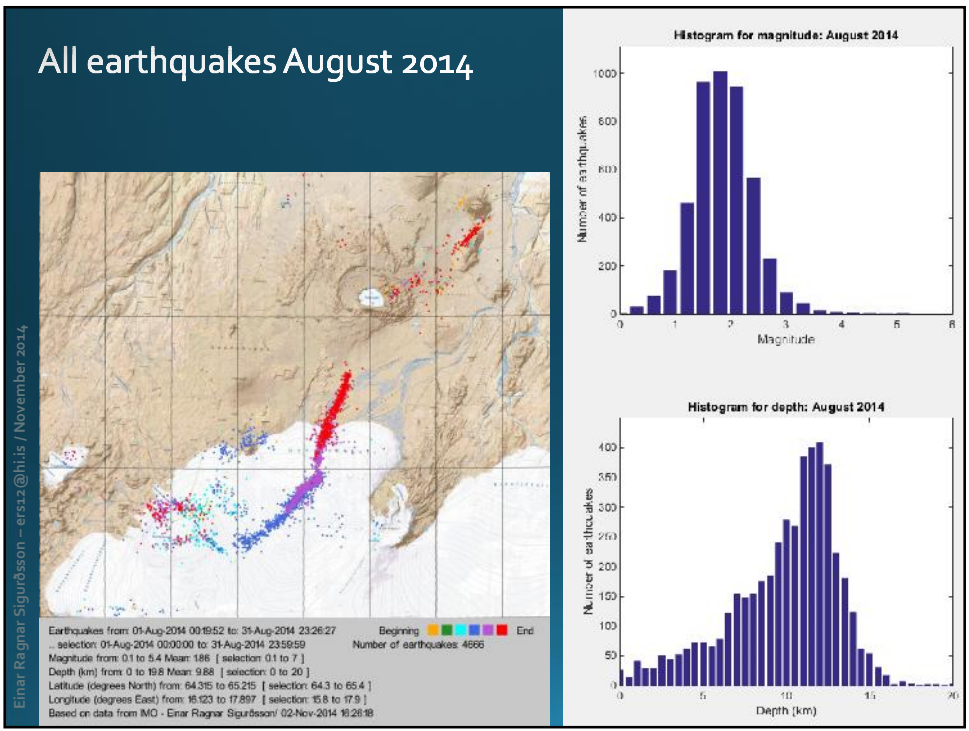
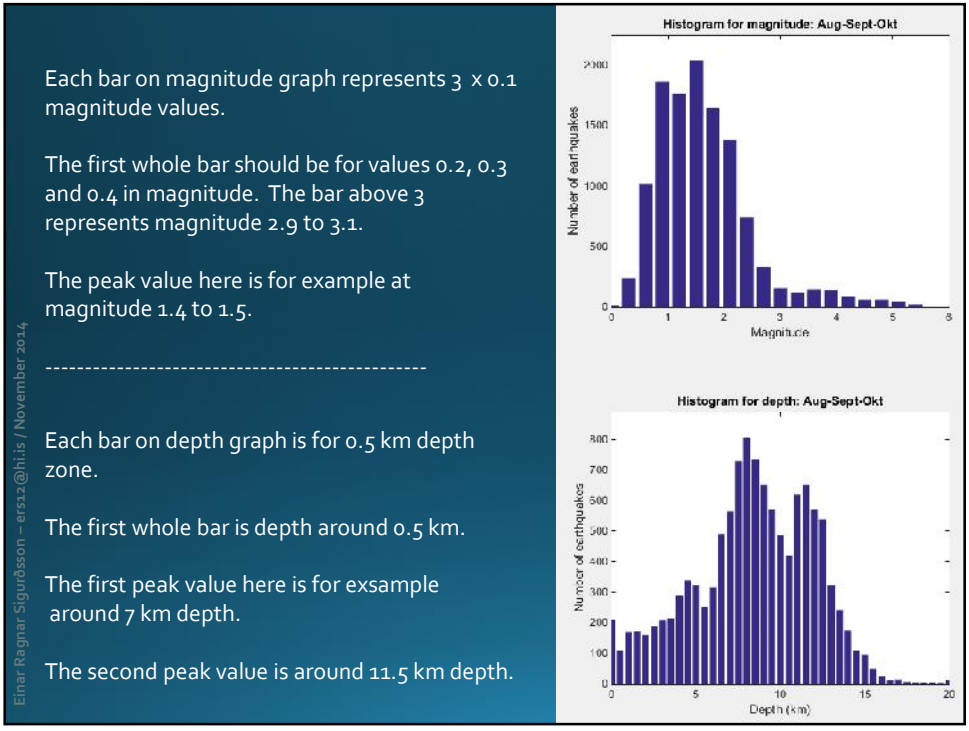
Excel and Matlab used

- Filtered data, for interesting time periods, depth, magnitude, location.
- Maps.
 - For each day, selected criteria and longer time periods as well.
- Histograms.
- 3D representation.
- Earthquakes from beginning of August to end of October.

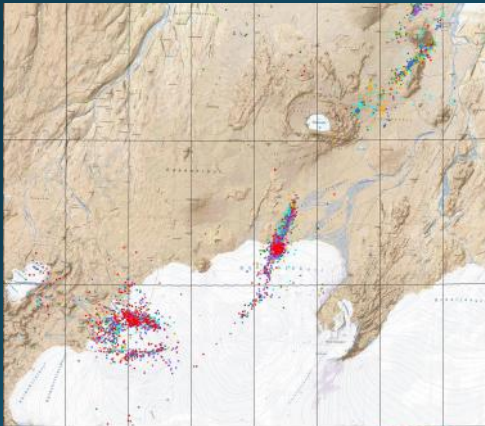


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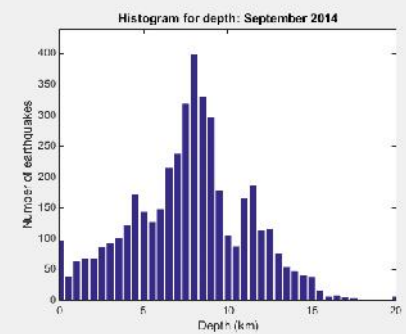
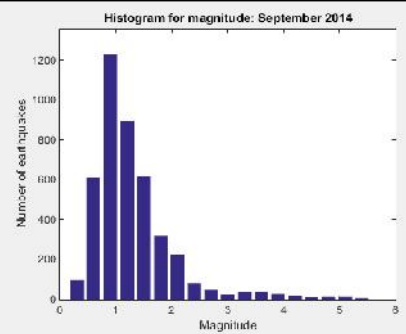




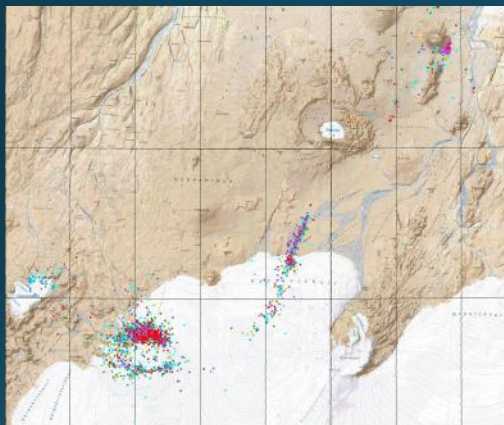
All earthquakes September 2014



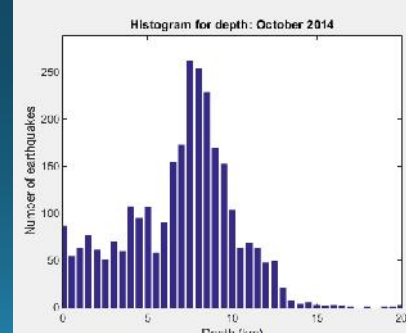
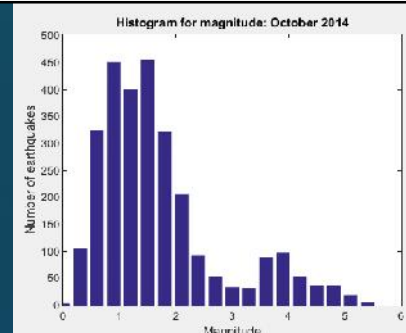
Earthquakes from: 01-Sep-2014 00:01:50 to: 30-Sep-2014 23:59:17
 - selection: 01-Sep-2014 00:00:00 to: 30-Sep-2014 23:59:59
 Magnitude from: 0.1 to 5.5 Mean: 1.32 [selection: 0.1 to 7]
 Depth (km) from: 0 to 16.9 Mean: 7.68 [selection: 0 to 20]
 Latitude (degrees North) from: 64.318 to 65.247 [selection: 64.3 to 65.4]
 Longitude (degrees East) from: 15.929 to 17.897 [selection: 15.8 to 17.9]
 Based on data from IMO - Einar Ragnar Sigurðsson / 02-Nov-2014 15:58:51



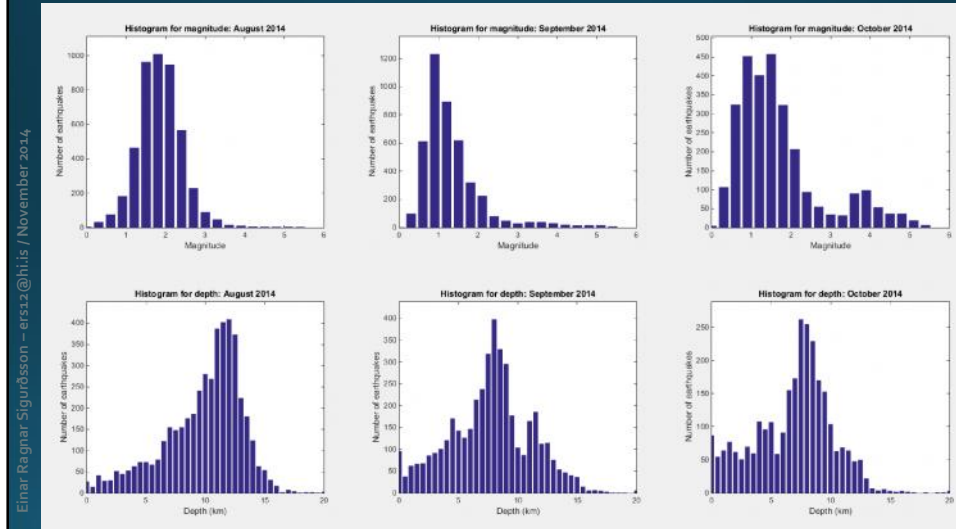
All earthquakes October 2014



Earthquakes from: 01-Oct-2014 00:07:37 to: 31-Oct-2014 21:32:22
 - selection: 01-Oct-2014 00:00:00 to: 31-Oct-2014 23:59:59
 Magnitude from: 0.1 to 5.4 Mean: 1.70 [selection: 0.1 to 7]
 Depth (km) from: 0 to 24.6 Mean: 6.88 [selection: 0 to 30]
 Latitude (degrees North) from: 64.32 to 65.247 [selection: 64.3 to 65.4]
 Longitude (degrees East) from: 15.95 to 17.9 [selection: 15.8 to 17.9]
 Based on data from IMO - Einar Ragnar Sigurðsson / 03-Nov-2014 00:08:25



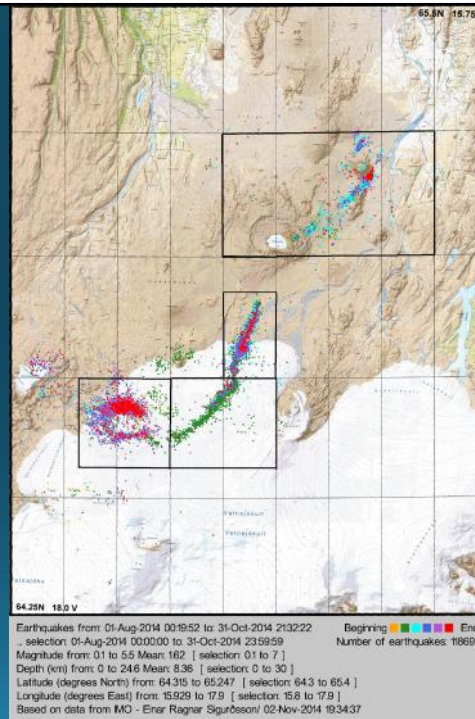
All earthquakes for each month



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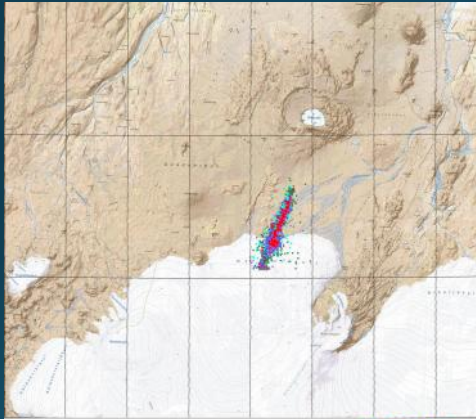
Focus on different areas

- The Caldera
- Magmatic dyke
- Eruption fissure
- Askja and Herðubreiðartögl



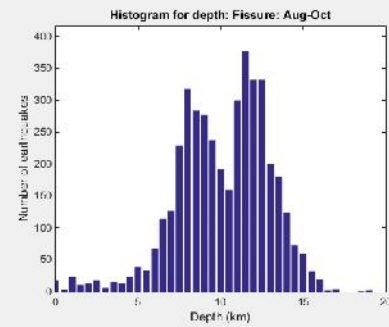
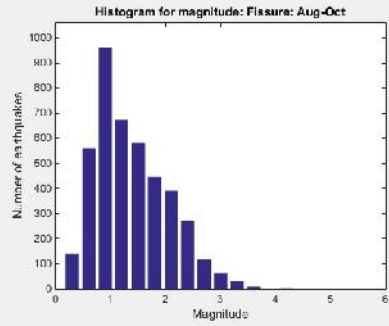
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Eruption fissure: Aug-Sept-Oct

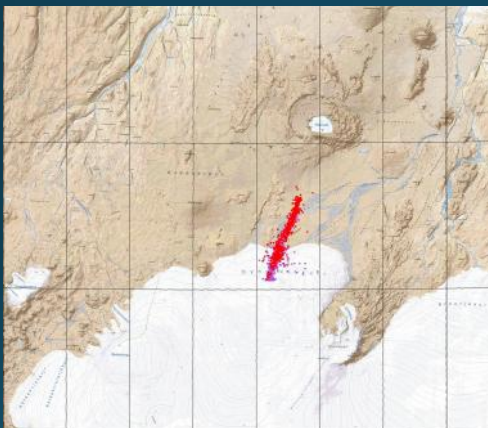


Earthquakes from: 01-Aug-2014 12:39:36 to: 30-Oct-2014 17:26:55
 - selection: 01-Aug-2014 00:00:00 to: 31-Oct-2014 23:59:59
 Magnitude from: 0.1 to 4.9 Mean: 1.38 [selection: 0.1 to 7]
 Depth (km) from: 0 to 19 Mean: 10.14 [selection: 0 to 30]
 Latitude (degrees North) from: 64.75 to 64.908 [selection: 64.75 to 64.925]
 Longitude (degrees East) from: 16.752 to 16.998 [selection: 16.75 to 17]
 Based on data from MO - Einar Ragnar Sigurðsson / 03-Nov-2014 12:52:49

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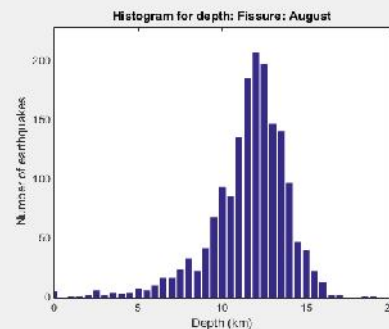
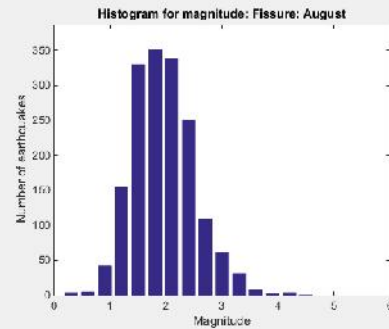


Eruption fissure: August

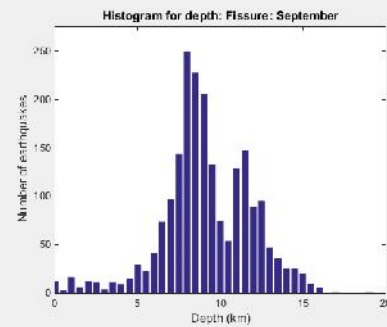
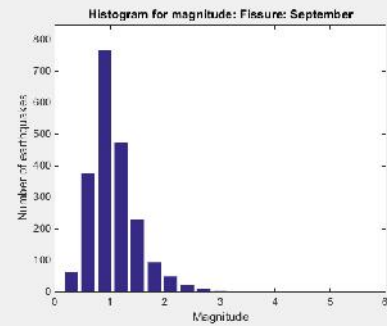
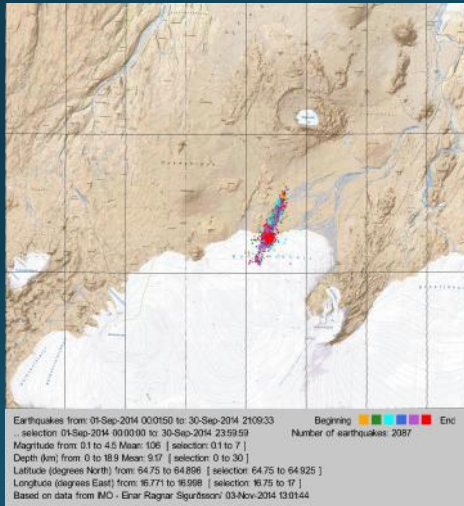


Earthquakes from: 01-Aug-2014 12:39:36 to: 31-Aug-2014 22:20:10
 - selection: 01-Aug-2014 00:00:00 to: 31-Aug-2014 23:59:59
 Magnitude from: 0.2 to 4.5 Mean: 1.96 [selection: 0.1 to 7]
 Depth (km) from: 0 to 16 Mean: 11.59 [selection: 0 to 30]
 Latitude (degrees North) from: 64.75 to 64.908 [selection: 64.75 to 64.925]
 Longitude (degrees East) from: 16.752 to 16.984 [selection: 16.75 to 17]
 Based on data from MO - Einar Ragnar Sigurðsson / 03-Nov-2014 13:00:28

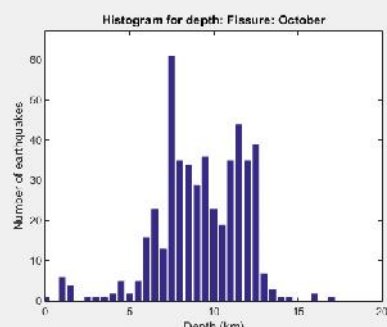
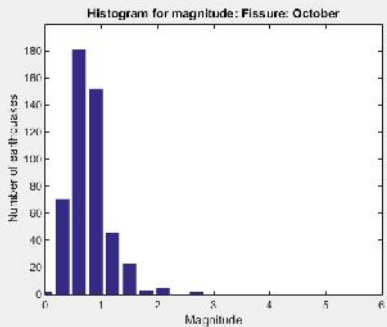
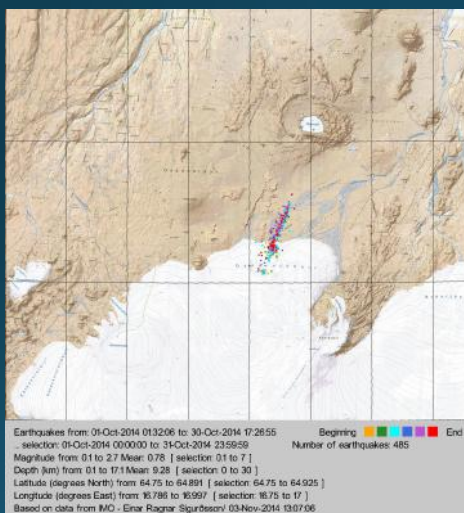
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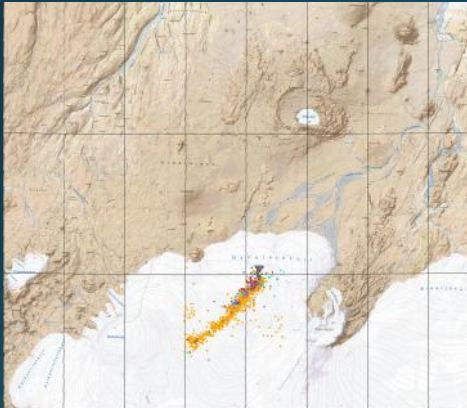
Eruption fissure: September



Eruption fissure: October

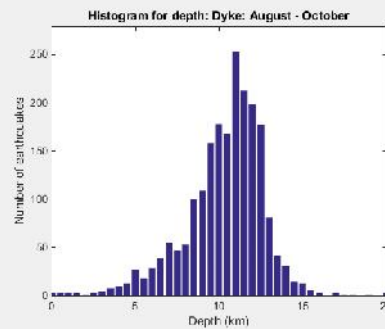
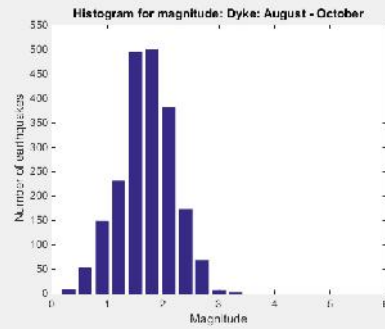


Magmatic Dyke: August to October

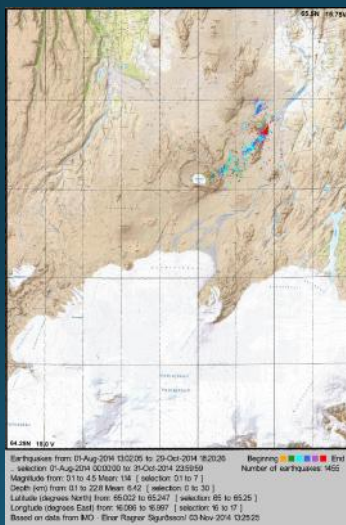


Earthquakes from 09-Aug-2014 20:40:42 to 30-Oct-2014 11:02:17
 - selection: 01-Aug-2014 00:00:00 to: 31-Oct-2014 23:59:59
 Magnitude from: 0.2 to 3.3 Mean: 1.70 [selection: 0.1 to 7.1]
 Depth (km) from: 0.1 to 24.2 Mean: 10.35 [selection: 0 to 30]
 Latitude (degrees North) from: 64.584 to 64.75 [selection: 64.56 to 64.75]
 Longitude (degrees East) from: 16.842 to 17.249 [selection: 16.75 to 17.25]
 Based on data from MO - Einar Ragnar Sigurðsson 03-Nov-2014 13:51:14

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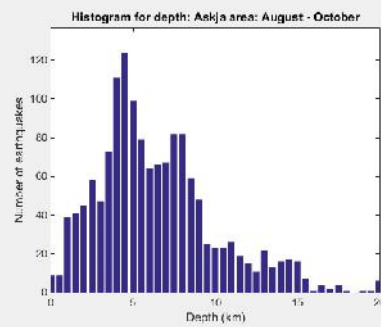
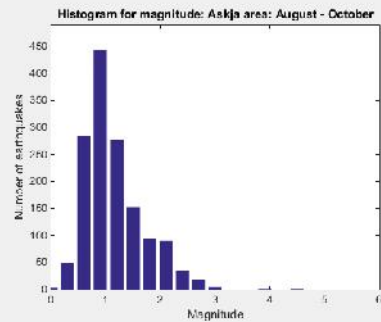


Askja and Herðubreiðartögl: August to October

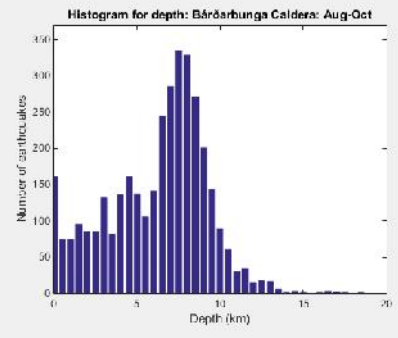
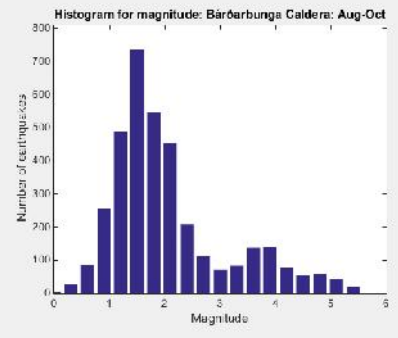
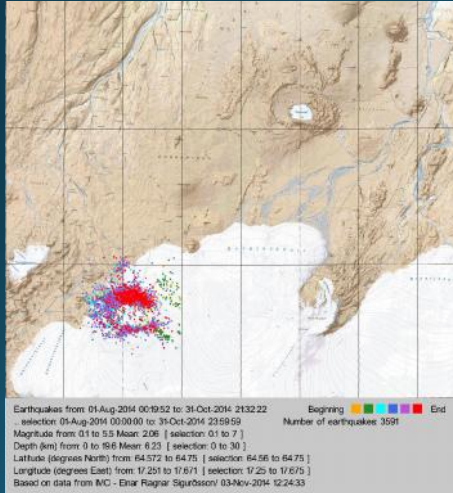


Earthquakes from 01-Aug-2014 13:02:25 to 29-Oct-2014 18:25:26
 - selection: 01-Aug-2014 00:00:00 to: 31-Oct-2014 23:59:59
 Magnitude from: 0.1 to 4.5 Mean: 1.94 [selection: 0.1 to 7.1]
 Depth (km) from: 0.1 to 22.8 Mean: 8.42 [selection: 0 to 30]
 Latitude (degrees North) from: 65.022 to 65.247 [selection: 65 to 65.25]
 Longitude (degrees East) from: 16.088 to 16.967 [selection: 16 to 17]
 Based on data from MO - Einar Ragnar Sigurðsson 03-Nov-2014 13:25:26

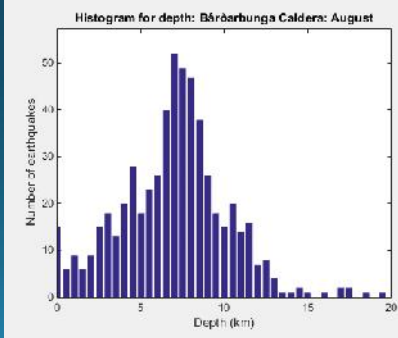
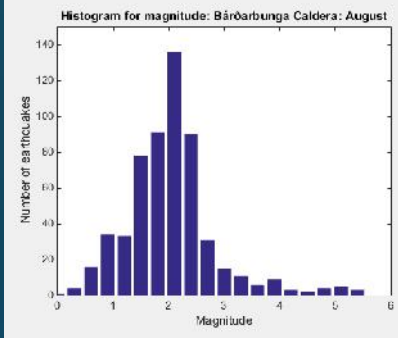
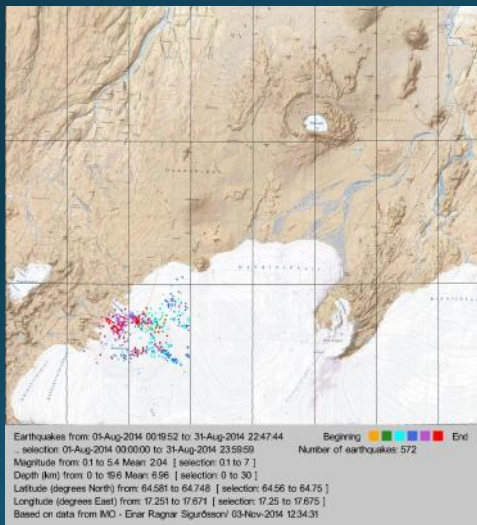
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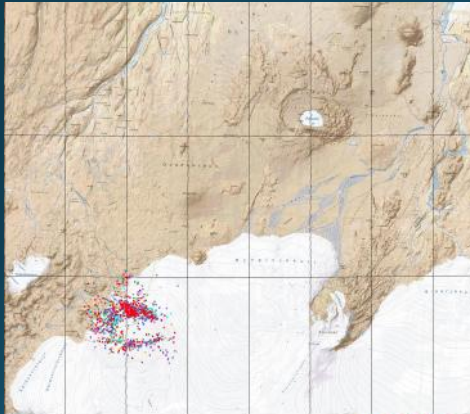
Bárðarbunga caldera: Aug - Oct



Bárðarbunga caldera: August

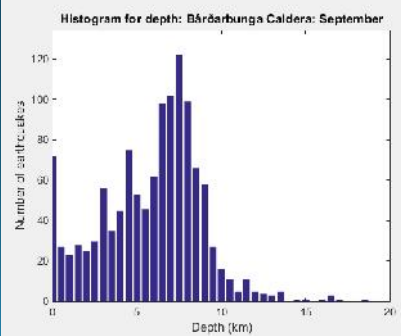
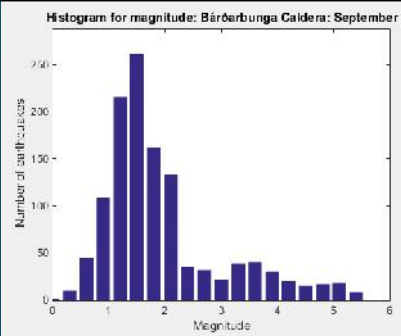


Bárðarbunga caldera: September

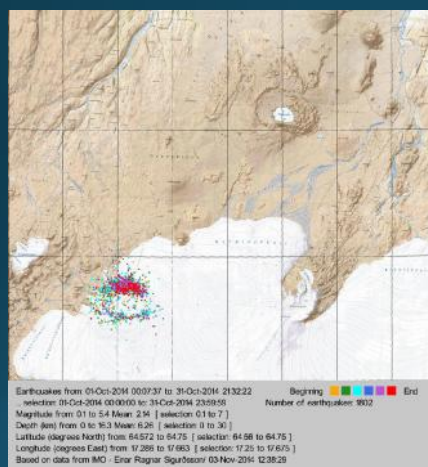


Earthquakes from: 01-Sep-2014 00:30:34 to 30-Sep-2014 23:19:17
 selection: 01-Sep-2014 00:00:00 to 30-Sep-2014 23:59:59
 Magnitude from 0.1 to 5.5 Mean: 1.94 [selection: 0.1 to 7]
 Depth (km) from 0 to 16.6 Mean: 5.84 [selection: 0 to 30]
 Latitude (degrees North) from: 64.584 to 64.746 [selection: 64.56 to 64.75]
 Longitude (degrees East) from: 17.285 to 17.661 [selection: 17.25 to 17.675]
 Based on data from IVO - Einar Ragnar Sigurðsson/ 03-Nov-2014 12:44:02

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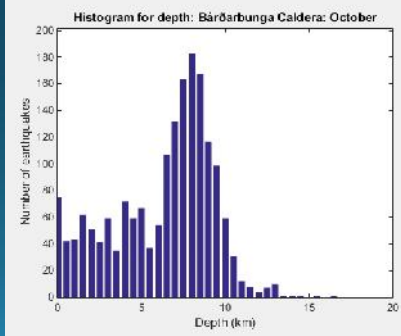
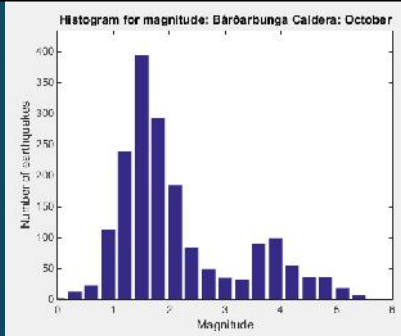


Bárðarbunga caldera: October

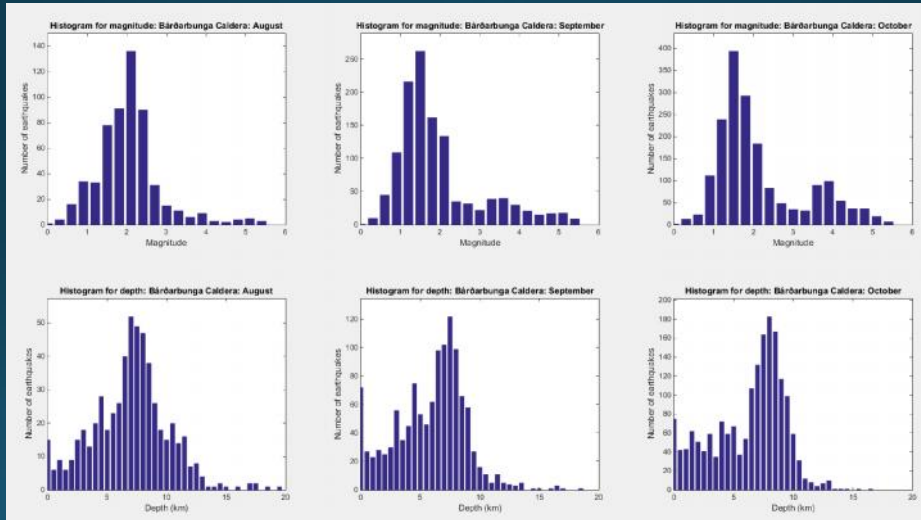
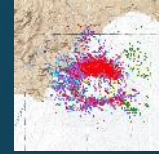


Earthquakes from: 01-Oct-2014 00:57:37 to 31-Oct-2014 21:32:22
 selection: 01-Oct-2014 00:00:00 to 31-Oct-2014 23:59:59
 Magnitude from 0.1 to 5.4 Mean: 2.3 [selection: 0.1 to 7]
 Depth (km) from 0 to 16.3 Mean: 6.26 [selection: 0 to 30]
 Latitude (degrees North) from: 64.572 to 64.75 [selection: 64.56 to 64.75]
 Longitude (degrees East) from: 17.286 to 17.663 [selection: 17.25 to 17.675]
 Based on data from IVO - Einar Ragnar Sigurðsson/ 03-Nov-2014 12:38:29

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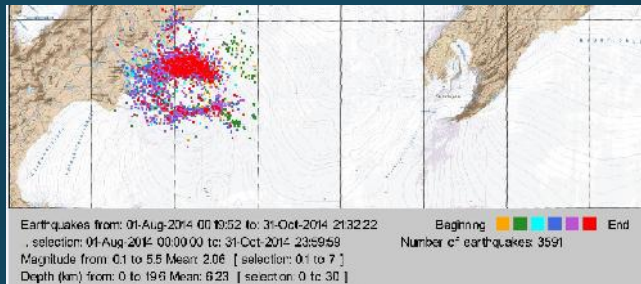


Bárðarbunga: earthquakes for each month

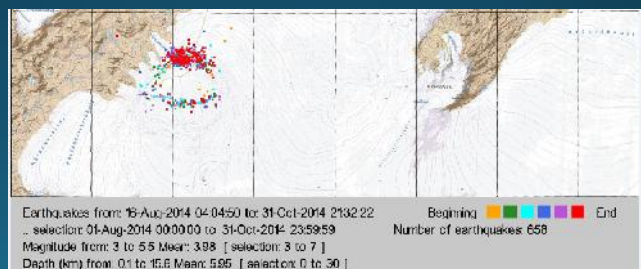


Bárðarbunga caldera

All Earthquakes Aug to Oct

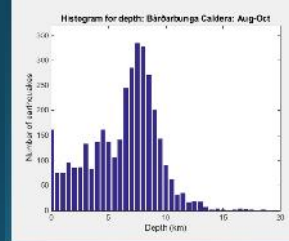
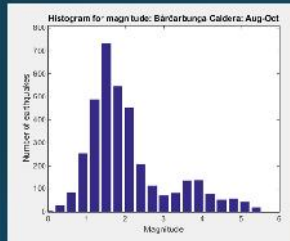


Magnitude 3 and above Aug to Oct

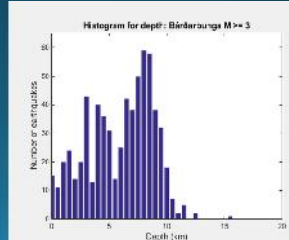
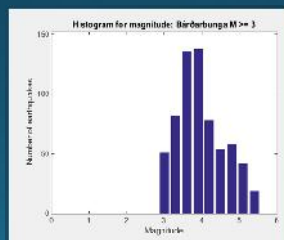


Bárðarbunga caldera

All Earthquakes
Aug to Oct



Magnitude 3
and above
Aug to Oct



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