

Seismic activity in Iceland 2015 – 2016 and testing of near-real time automatic relative locations

Gunnar B. Guðmundsson¹ and the Natural Hazards monitoring team

¹Icelandic Meteorological Office, Bústaðavegi 7-9, 108 Reykjavík, Iceland, gg@vedur.is

At present, in September 2016 the SIL seismic monitoring network consists of around 70 seismic stations. The number of earthquakes located by the SIL system in 2015 was about 24000 and about 17000 in 2016, end of September. Following the seismicity from south to north, the northern most part of the Reykjanes ridge had large seismic swarms in June and July 2015. The largest earthquake in the swarms occurred on 1 July and had a magnitude $M_{lw}5.0$. Reykjanes peninsula had occasionally some small swarms, mainly at the tip of the peninsula, at Fagradalsfjall and at Kleifarvatn lake. The largest earthquakes occurred close to the Kleifarvatn lake during swarms in late May 2015 with an $M_{lw}4.0$ earthquake and at the beginning of February 2016 with an $M_{lw}3.9$ earthquake. There was a persistent seismic activity at Husmuli in the Hengill area. The area is close to a geothermal power plant where wastewater is injected into wells. A large seismic swarm occurred there in September 2016 and it had two earthquakes of magnitude $M_{lw}3.6$ and $M_{lw}3.4$. Very few seismic swarms occurred in other parts of the Hengill area but the largest earthquakes reached magnitude $M_{lw}3$. In the South Iceland seismic zone few earthquakes reached magnitude about $M_{lw}3$ and microseismicity prevailed at known faults. Seismic activity in the Katla volcano was relatively low in 2015. Two earthquakes $M_{lw}3.3$ and $M_{lw}3.2$ occurred respectively in the western part of the caldera in February and in the southern part of it in September. In 2016 the seismic activity within the caldera increased during the summer months. At the end of August two $M_{lw}4.5$ and $M_{lw}4.4$ occurred in the northeastern part of the caldera. Late in September an $M_{lw}3.9$ earthquake occurred in the southern part of the caldera and some days later it was followed by large swarm that lasted 2-3 days and had several $M_{lw}3$ earthquakes. A great number of the detected earthquakes during 2015 and 2016 originated in the northwestern part of Vatnajökull ice cap in connection with the Bárðarbunga volcano and the eruption in Holuhraun that started late August 2014. The last two $M5$ earthquakes in the Bárðarbunga caldera in a series of many before occurred in January 2015. The Bárðarbunga caldera was very seismically active and had many $M4$ earthquakes until the end of February when the eruption ceased. The dyke east of the Bárðarbunga caldera was still very seismically active until the autumn of 2015 but has since decreased very much. In the autumn of 2015 the seismic activity in the Bárðarbunga caldera increased and has since been steadily increasing with some $M4$ earthquakes. Seismicity north of the Vatnajökull ice cap, close to Herðubreið table mountain and the Askja volcano has been rather high during 2015 and 2016. In the Tjörnes Fracture Zone the most seismic activity has been on the Grímsey Oblique Rift Zone extending southeast from the Grímsey island into the Öxarfjörður bay. The largest event had a magnitude $M_{lw}3.8$ with origin east of Grímsey island during a swarm end of October 2015. A seismic swarm occurred in the western part of the Húsavík-Flatey-Fault early August 2016 and had an $M_{lw}3.7$ earthquake.

Since 2014 we have been testing in near-real time automatic relative locations (ARL) for the South Iceland Seismic Zone. It was implemented in connection with the European REAKT project and lead by Kristin Vogfjörð. We use cross-correlation and double difference methods from Ragnar Slunga. We correlate new single automatic located events with waveforms of events from a high-resolution library (catalog) of active mapped faults in the area and also from a library of well located single events. Some results from these testing will be shown.