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Bárðarbunga volcano – post-eruption trends following the Holuhraun eruption in 2014-2015

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The Bárdarbunga volcano in central Iceland experienced a major unrest, lateral dyking, and eruption in August 2014-February 2015. The eruption was accompanied by caldera collapse, a truly rare event that has not been monitored in such detail before, providing a unique opportunity for better understanding the volcanic structure and processes. The collapse was extensive as the 8x11 km caldera gradually subsided and a subsidence bowl up to 65 m deep was formed, while about 1.8 km3 of magma drained laterally along a subterranean path, forming a flood basalt 47 km northeast of the volcano. The collapse was accompanied by high rates of seismicity and 80 earthquakes between M5-M5.8 were recorded. Using various geophysical and geochemical data, together with modelling, the magma reservoir has been estimated to reside at about $\sim$8-12 km depth beneath the caldera and recent findings show that the subsidence was driven by a feedback between the pressure of the piston-like block overlying the reservoir, and the 47 km long magma outflow path. The collapse and magma outflow gradually declined until the eruption ended on the 27th February 2015.

After the end of the eruption, GPS deformation data show horizontal movements that seem to be in line with an inflation signal centered at the caldera, but the pattern is more complicated than during the co-eruptive period. The seismicity continued to decline, both in the far end of the dyke as well as within the caldera. However, in September 2015 seismicity within the caldera started to increase again. Interestingly, this increase was identified in terms of increased earthquake magnitudes while earthquake rate remained relatively constant. This resulted in a volcanic earthquake catalog with the highest seismic moment release rate ever recorded in Iceland during times of volcanic quiescence.

Here we present a seismic waveform correlation analysis which reveals a dramatic change occurring between February and May 2015, where the earthquakes' first motion polarity reverses sign. This time coincides with the ending of the caldera collapse and the eruption. We investigate relative locations of the earthquakes as well as moment tensor solutions and compare results of the post-eruption period to the period during caldera subsidence and eruptive activity. In addition, we present analysis of post-eruption trends of the deformation data as well as seismicity trends. Preliminary results suggest that caldera fault movements where reversed soon after the eruption ended in spring 2015 when we also observe outwards movement of GPS stations around the caldera, indicating re-inflation long before any seismicity increase was detected. These data and their interpretation are vital to understanding the current status of the volcano and, eventually, to perform a more accurate and reliable hazard assessment.