Pre-Eruptive Seismic Tremor Signals During the Bardarbunga Eruption, Iceland

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The eruption of Bardarbunga volcano in Iceland in 2014/15 was preceded by two weeks of increased seismicity, seismic tremor, deformation and superficial faulting and graben formation. Propagating seismicity at 3 to 8 km depth was interpreted as the formation of a dyke while flow of magma was inferred from modelling of geodetic signals at slightly shallower depth.

We present the pre-eruptive seismic activity with a focus on seismic tremor. We analyse and locate the pre-eruptive tremor with a seismic array and an amplitude-based location method that together could resolve both lateral and upwards tremor source migration. We estimate the depth range of the source using numerical simulations and compare our results with hydrological and glaciological observations such as the formation of depressions (so called cauldrons) on the glacier surface. Our results indicate that tremor occurred pre-eruptively and can be linked to the gradual opening of the shallow crust shortly before an eruption started.