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The collapse mechanics at the Bardabunga caldera during the 2014/2015 volcanic eruption

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During the 2014-2015 fissure eruption of Bárðarbunga volcano in Iceland the central caldera experienced continuous subsidence of more than 65 meter. The subsidence was accompanied by a notable seismic sequence of 77 M> 5 earthquakes, for which full moment tensors and relative centroid locations were estimated. Strain release by earthquake rupture cluster mostly beneath the northern and southern caldera rims. We interpreted the earthquake radiation as frictional controlled rupture at segments of the caldera ring fault and additional sub-vertical CLVD sources below, possibly related to the response of the magma reservoir feeding the Bardabunga fissure eruption.

We discuss the magma reservoir depletion and develop an outflow model to understand the caldera subsidence. The strain buildup at the caldera ring faults is compared to the co-seismic stress release and the earthquake occurrence. A Brownian passage model is compared to a rate and state model to explain the observed inter-event times of earthquakes. We discuss simple physical relations between seismic and magmatic parameters.