Geophysical Research Abstracts
Vol. 19, EGU2017-1625-2, 2017
EGU General Assembly 2017


# Source parameter inversion for earthquakes in the Bardarbunga caldera (August 2014-February 2015) based on high-rate GPS data

Félix Rodríguez Cardozo (1), Vala Hjörleifsdóttir (1), Kristín Jónsdóttir (2), Halldor Geirsson (3), and Arturo Iglesias (1)

(1) Universidad Nacional Autónoma de México, Geophysics Institute, (2) Icelandic Meteorological Office, (3) University of Iceland, Faculty of earth sciences

In August 2014 a sequence of earthquakes took place in the Bardarbunga caldera (7x11 km) and a laterally propagating dike that connected the caldera with the Holuhraun lava field. The caldera earthquakes were coincident in time with the caldera subsidence (∼70 m) and the propagation of a dike, which ended in a fissural eruption in Holuhraun (Guðmundsson et al., 2016). The volcanic seismic sources represented by the moment tensor, commonly have a large non-double couple component, which implies that the source can not be described as a slip on a planar fault. However, encountering an apropiate physical mechanism that explain the non double couple component is a challenging task since there are several phenomena that could explain it, such as intrusive processes like dikes or sills (Kanamori et al 1993, Riel et al 2014) as well as geometric effects due slip on a curved fault (Nettles & Ekström, 1998).

The earthquakes in the Bardarbunga caldera are quite interesting not only due to the magnitudes (around seventy events between 5.0<M<5.7) and the large non double couple components; for some of them, the seismic waves were registered by a GPS high-rate station and for one (18th september 2014 Mw. 5.3), a ring fault model was built based on interferometric synthetic aperture radar (InSAR) also (Guðmundsson et al., 2016). Taking into account that the Bardarbunga caldera is covered by glacier (which makes difficult detecting changes in the surface using InSAR) and detecting waveforms in GPS stations is common only for large tectonics earthquakes (above Mw.7); observing a volcanic earthquakes simultaneously by InSAR and GPS is a rare and outstanding opportunity for constrain the volcanic seismic source . Likewise, if we assume that all the subsidence earthquakes in Bardarbunga have a common seismic source, we can use the same fault plane costrained for the 18th september earthquake, for inverting the seismic source of all the events in the caldera, only variying some parameters such as half duration and time shift.

In this work, we obtained a source parameter for the 18th september earthquake and used it as an inicial solution for looking for a model of several point sources, that depict all the earthquakes registered in the Bardarbunga caldera. We use the vertical ring fault obtained trough the InSAR modeling and calculate synthetic seismograms (with several half duration values) associated with vertical slip on this plane. Likewise, for comparing the observed and the synthetics seismograms we also introduce a time shift variation.