

GEODETIC OBSERVATIONS OF THE 29 MAY 2008 SOUTH ICELAND EARTHQUAKE

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Abstract

The South Iceland Seismic Zone (SISZ) is an ~80 km long E-W transform zone accommodating the relative spreading of the North American and Eurasian plates across southern Iceland. The accumulated stress due to the plate spreading is released by earthquakes in the zone. The SISZ does not rupture along its whole length, but on many parallel N-S right-lateral strike slip faults. The largest earthquakes are therefore limited to moderate magnitudes ($M \sim 6-7$), and often occur in sequences of similar size events, at times propagating from East to West. After a quiet period of 88 years two $M_w=6.5$ events struck the eastern and central part of the SISZ in June 2000. The main shocks ruptured two parallel N-S faults, spaced about 17 km apart, occurring 3 1/2 days apart (Árnadóttir *et al.*, 2001; Pedersen *et al.*, 2001, 2003). The sequence continued on May 29, 2008 when two $M_w 6$ events occurred in the western part of the SISZ, rupturing two parallel N-S faults located about 4 km from each other. The small time delay (~3 sec) between the two events suggests that the western one was dynamically triggered by the initial event (Hreinsdóttir *et al.*, 2009).

Here, we present a geodetic study of the May 2008 earthquakes based on continuous and annual GPS measurements and InSAR images. We propose a dislocation model for the fault geometry, location and the slip distribution over the fault planes that best fit the geodetic data. We also present the post-seismic displacements recorded by a temporary GPS network that we maintained during the first month following the events. A transient deformation signal was recorded during the first 10 days following the earthquakes. This transient motion does not appear to be caused by poro-elastic rebound due pressure changes in the ground water system, as was observed following the June 2000 (Jónsson *et al.*, 2003).

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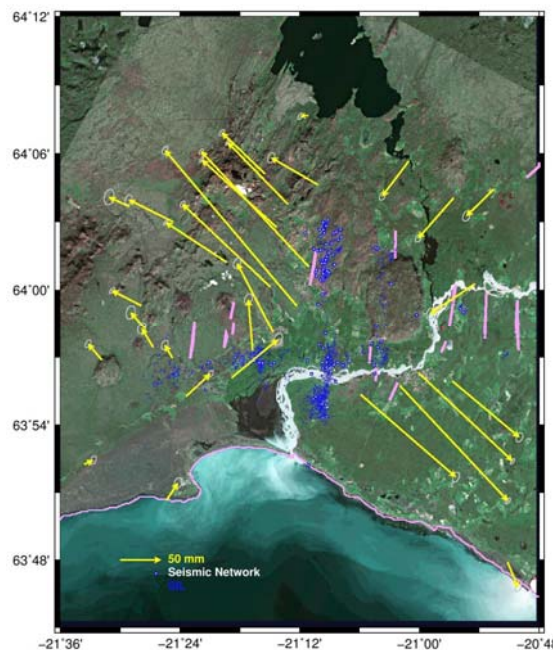


Figure 1: GPS measurement of the co-seismic displacements for the 29 of May 2008 earthquake in the Ölfus area. Blue dot highlight the aftershocks recorder by SIL network.

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