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# A geodetic source study of the May 2008 earthquake doublet in SW Iceland

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An earthquake doublet struck the western part of the South Iceland seismic zone (SISZ) on 29 May 2008. The SIL seismic network, operated by the Icelandic Meteorological Office (IMO), recorded the initial event and immediate aftershock activity illuminating both N-S and E-W structures over a broad area. The first main shock was located at 63.972N and 21.072W at ∼5 km depth (IMO). The waves from the second rupture are, however, embedded in the code from the first event, making precise location and estimation of the main shock magnitudes difficult. Continuous GPS (CGPS) stations in the epicentral area recorded co-seismic offsets with up to 200 mm of horizontal motion. We estimate the co-seismic surface deformation observed by GPS and satellite radar data (InSAR) and invert the geodetic data to find the optimal geometry, location and slip on the main faults. The geodetic data suggest rupture on two main N-S right-lateral strike slip faults located ∼4 km apart. The slip models for the events indicate that they have similar moment magnitudes (Mw∼6) and the combined moment release agrees with the Mw6.3 estimated by NEIC. Analysis of high-rate (1 Hz) CGPS data suggests that slip on the second fault initiated within 3 sec of the first main shock. Static Coulomb failure stress calculations show that the first event caused a stress increase in the area of the main asperity (i.e., at the location of the largest slip patch) on the second fault. However, we cannot rule out dynamic stress triggering due to the short time between the two main events. The 29 May 2008 earthquake doublet appears to be a continuation of the earthquake sequence that started in June 2000, when two Mw6.5 events struck the eastern and central part of the South Iceland Seismic Zone, in the span of 81 hours. The main shocks in the June 2000 and May 2008 sequences released about half of the moment accumulated by plate motion since the previous earthquake sequence in 1896–1912. Therefore, continued earthquake activity with moderate size events rupturing N–S faults in the SISZ in the coming decades is likely.