



A map of Holocene fault structures in the South Iceland Seismic Zone

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The transform branch of the plate boundary in South Iceland, the South Iceland Seismic Zone, shows widespread evidence of Holocene faulting. Glaciated surfaces, alluvial planes and Postglacial lava flows are fractured along the 15 km wide, 70 km long, E-W trending seismic zone. A project to map by GPS-instruments all recognisable Holocene fault structures in this zone is near completion. A large majority of all fractures strike NNE to NE and form left-stepping, en echelon fracture arrays with a northerly trend. They are associated with right-lateral faulting at depth. Right-stepping arrays also exist, apparently associated with faulting on conjugate faults with ENE strike, but they are mostly of secondary nature. Other fault trends also occur, but are rare. Push-up structures are prominent in association with the en echelon arrays, sometimes reaching heights of several meters. Fractures active during a few of the large, historical earthquakes in this region have been traced, e.g. the 1630, 1784, 1896, and 1912 events. The fractures are found within narrow, N-S trending zones crossing the seismic zone. Thus the large scale, left-lateral transform motion across the plate boundary is accommodated by right-lateral slip on a series of small transverse faults arranged side by side within the zone and by slight rotation of the blocks between them, a process sometimes called "bookshelf tectonism". Fractures formed during the earthquakes of June 17 and 21 ($M_w=6.5$) in 2000 follow this pattern and confirm this general model of faulting along the transform zone.

A swarm of extensional fractures in the Grímsnes district near the northern border of the fractured zone forms a separate population of fractures and has been identified as a part of an active volcanic system. The Grímsnes volcanic system is placed unconformably on older crust and its fissure swarm is immature, consisting of relatively

short, discontinuous segments of extensional fractures with displacements up to a few meters.