Tectonics of the Þeistareykir fissure swarm

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Abstract — *Tectonic activity within the Tjörnes Fracture Zone is characterized by strike-slip and extensional movements within three tranform zones, the Húsavík-Flatey Fault System, the Grímsey Volcanic Zone, connecting the offshore Kolbeinsey Ridge with the Northern Volcanic Zone on land, and the Dalvík lineament. We mapped the Þeistareykir volcanic system at the northwestern margin of the Northern Volcanic Zone using multibeam bathymetric maps, aerial photographs and satellite images. The 70–80 km long and 7–8 km wide Þeistareykir fissure swarm consists of large normal faults with maximum displacements of 200–300 meters along its western rim and rift fissures further east. A marked change in rift direction across the Húsavík-Flatey Fault System reflects complex tectonics at the junction of a transform fault system and a divergent volcanic zone. Normal faults on land and offshore have an average azimuth close to N25°E whereas the average azimuth of rift fissures changes from ~N22°E south of the Húsavík- Flatey Fault System to ~N43°E, in western Kelduhverfi. The 1618 and 1885 AD rifting events within the Þeistareykir fissure swarm were most likely fed by lateral magma propagation from the Þeistareykir volcanic center, northwards to the western part of Kelduhverfi. Although limited, historical reports indicate that the January 1885 rifting event triggered a ~M 6.3 earthquake near Lake Víkingavatn. The 1885 rifting event in western Kelduhverfi was similar to the 1975–1976 rifting event in eastern Kelduhverfi, when a laterally propagating dike from the Krafla caldera triggered the M_S 6.4 Kópasker earthquake on January 13th, 1976. Seismic sequences within the Húsavík- Flatey Fault System and the Þeistareykir fissure swarm in 1867–1868 and 1884–1885 indicate a tectonic relationship between the rift zone and the transform zone.*