



Fracture systems of the Western Volcanic Zone, Iceland

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The Western Volcanic Zone in Iceland is an approximately 120 km long and 30-40 km wide branch of the Mid-Atlantic plate boundary, extending towards the north from its triple junction with the Reykjanes Oblique Rift and the South Iceland Seismic Zone. The Western Volcanic Zone is an ultra-slow spreading part of the plate boundary, since the spreading in southern central Iceland is split between the Western and the Eastern Volcanic Zones. These volcanic zones, as well as the South Iceland Seismic Zone and the Hofsjökull volcanic system, form the boundary of the Hreppar microplate.

In this study, fractures, including tensional fractures and faults, as well as eruptive fissures, were mapped in detail from aerial photographs. Orientation of the fractures was also calculated. This was done to study the extent of the volcanic zone, as well as its characteristics.

The Western Volcanic Zone can be divided into several different fracture zones; The Hengill, Prestahnúkur, Kjölur, Hrómundartindur and Krákur fissure swarms, as well as an east-west oriented fracture system of unknown origin west of the Western Volcanic Zone. The Hengill fissure swarm is located in the southern part of the Western Volcanic Zone. It extends at least 30 km north of the Hengill central volcano. The Þingvellir graben is a part of the Hengill fissure swarm. The Prestahnúkur fissure swarm extends about 20 km towards the north and likely about 35 km towards the south from the Prestahnúkur central volcano. This fissure swarm is characterized by large-offset normal faults in Pleistocene formations. The Kjölur fissure swarm is located between the Western Volcanic Zone, and the Hofsjökull central volcano. We suggest that this fissure swarm, which is about 25 km long, likely belongs to the Hofsjökull volcanic system since its northern part bends towards the Hofsjökull central volcano. The Hrómundartindur fissure swarm extends towards the north from Hrómundartindur, which is located next to Hengill. This is the most uncertain fissure swarm found. The Krákur fissure swarm is the northernmost fissure swarm. It is located north of the Langjökull glacier. It is characterized by few fractures and eruptive fissures, with variable fracture orientations, although the fissure swarm is mostly northerly oriented.

Fractures in the Western Volcanic Zone generally trend approximately perpendicular to the plate spreading. Fracture orientations nevertheless become more irregular towards the north, where plate spreading is slower or even absent. Similarly, fracture density decreases towards the north. This shows how plate spreading plays a significant role in developing the characteristics of a rift zone.