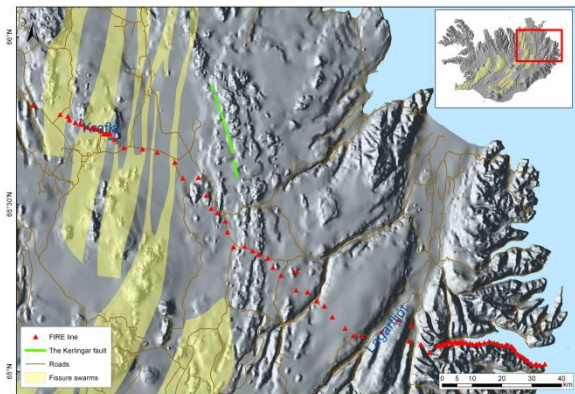


# THE KERLINGAR FAULT, NORTH EAST ICELAND, A HOLOCENE NORMAL FAULT EAST OF THE DIVERGENT PLATE BOUNDARY

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## Extended abstract

The Kerlingar fault is located in the easternmost part of the deformation zone of the Northern Volcanic Rift Zone (NVZ); about 14 km east of Grímsstaðir, NE Iceland. The total length of the fault is at least 30 km, although its surface manifestation is divided into at least 7 segments. It is an eastward-dipping normal fault, with a throw of ~4-10 m, as measured in Holocene deposits. The general orientation of the fault is ~NNW, and it is gently curved so the northern end is more westerly oriented than the southern part.

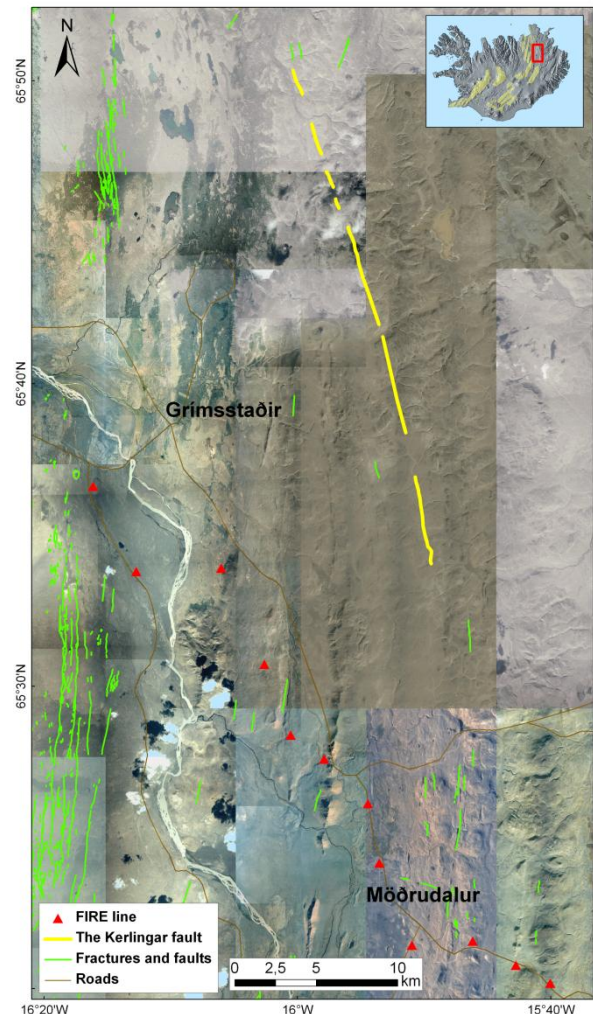


*Northeast Iceland. The Kerlingar fault and the FIRE line. Information on fissure swarms from Einarsson and Sæmundsson (1987).*

The fault is unusual in some respects:

- It is unusually long and straight, compared with fractures and normal faults within the Northern Volcanic Rift Zone.
- It is eastward-dipping.
- It is not parallel with the fissure swarms in the NVZ at this latitude.
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Very few earthquakes have been detected in this area in the last decades. Our calculations indicate, however, that the maximum potential size of an earthquake originating at this fault might be about  $M_w=6.7$ .

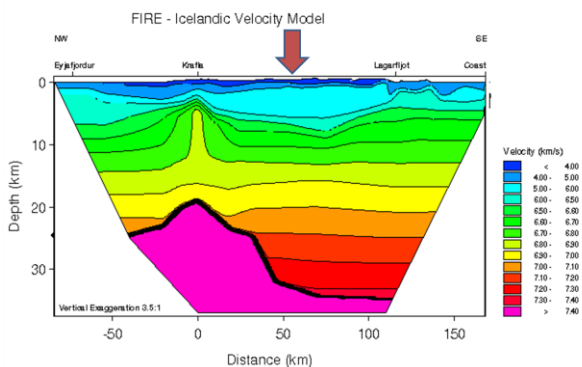


*The Kerlingar fault and the FIRE line. Also seen in the western part of the image are fractures and faults from the Askja fissure swarm. Image from Loftmyndir©.*

We suggest three possible explanations for the existence of this fault:

1. That the fault is caused by stress transfer mechanism related to its location at the end of the Kverkfjöll fissure swarm.
2. That the fault has been formed by stress transfer in relation to the activity of the Húsavík fault zone.
3. That the fault formed or was reactivated by isostatic response to

rapid crustal rebound (surface uplift) during the last deglaciation. The crustal thickness increases abruptly in this region (Staples et al., 1997), from 20 km beneath the volcanic rift zone to 35 km beneath the Eastern Fjords. The thicker, more rigid Eastern Fjords block reacts differently to vertical loading and unloading than the thinner crust within the volcanic rift zone, overlying a lower density upwelling mantle.



Best fit P-wave velocity model by Staples et al (1997). Arrow points to the approximate location where the fault cuts the transection.

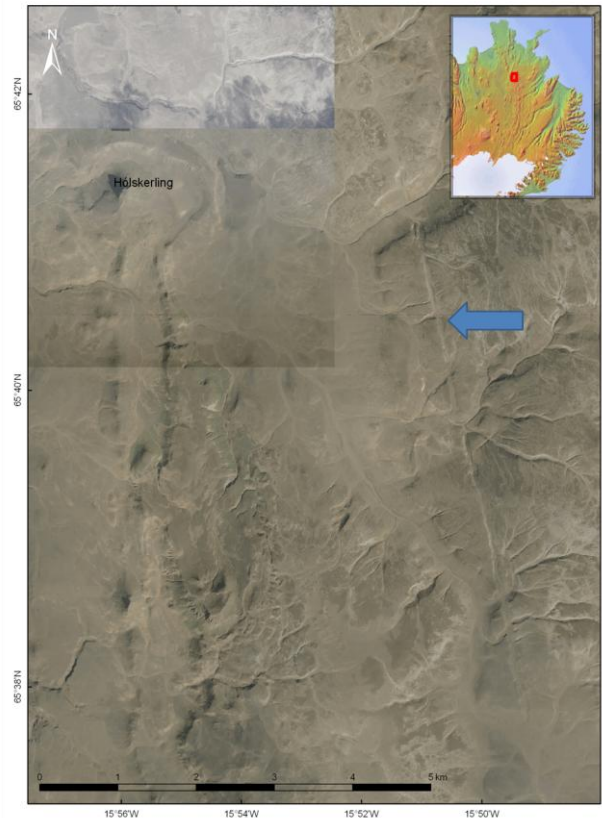
We favor explanation #3 for a number of reasons:

1. It explains why the fault dips towards the east.
2. It explains the unusual direction of the fault, compared with faults within the NVZ.
3. It might also explain why the fault is so long and straight, and with a different character from the faults within the NVZ, as this fault would then not be formed in magmatic events, as the other faults are thought to have formed.

## References:

Einarsson P, Sæmundsson K (1987) Earthquake epicenters 1982-1985 and volcanic systems in Iceland (map). In: Sigfússon I (ed) Í hlutarins eðli, Festschrift for Þorbjörn Sigurgeirsson. Menningarsjóður, Reykjavík.  
 Staples RK, White RS, Brandsdóttir B, Menke W, Maguire PKH, McBride, JH (1997). Faroe-Iceland Ridge Experiment 1. Crustal structure of northeastern Iceland. J. Geophys. Res. 102, B4, 7849-7866.

## Images of the fault:



Blue arrow points to a part of the Kerlingar fault. Image from Loftmyndir©.



The Kerlingar fault, visible as a line of snow. View towards the south.



*The Kerlingar fault. For scale, PE is standing on the lower slope of the fault.*



*The Kerlingar fault, view towards the northeast.*