The Kerlingar fault, Northeast Iceland:
A Holocene normal fault east of the divergent plate boundary

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Abstract — *The Kerlingar fault is a ∼30 km long fault located at the boundary between the Northern Volcanic Rift Zone, and the Tertiary Eastern Fjords Block in Iceland. The fault has a throw of 2–9 m down to the east and is most likely a normal fault. It probably ruptured in several earthquakes over extended time, but assuming it ruptured in one event it would have a magnitude of about M_w=6.7. The Kerlingar fault forms a sharp offset in a flat moraine, showing that the fault was active in the Holocene. Several characteristics of the fault are different from that of the presently active fissure swarms of the NVZ. It is unusually long, straight and continuous, and it is parallel with the boundary between the NVZ and EFB not perpendicular to the plate spreading. We consider three possible explanations for the existence of the fault. It may be formed in a rifting event, by stress transfer in relation to the Húsavík transform, or by a stress field caused by rapid crustal unloading during the last deglaciation. We favour the third explanation but note that the other two cannot be excluded. Differential movements at the NVZ-EFB boundary during deglaciations can occur as the two crustal blocks have different density, Young's modulus, thickness, and subcrustal viscosity. They therefore respond differently to the unloading. This may explain why the fault is parallel with the NVZ-EFB boundary and not with the Holocene fissure swarms in the NVZ. Other faults at the NVZ-EFB boundary may be formed in a similar manner. Magma may have intruded some of them to form the distinct arcuate pattern of hyaloclastite ridges at the boundary between the NVZ and the EFB. Future model calculations could constrain better the effects this process has on the formation of faults.*