

Stress Map Iceland 2016



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Introduction

Iceland is located on the Mid-Atlantic Ridge which is the plate boundary between the Eurasian and the North American plate. It is one of the few places where an active spreading can be observed onshore. In this map we present a comprehensive compilation of the orientation of maximum horizontal stress (S_{Hmax}). In particular we interpret borehole breakouts and drilling induced fractures from borehole image logs in 57 geothermal wells onshore Iceland. The borehole results are combined with other stress indicators including earthquake focal mechanism solutions, geological information and overcoring measurements resulting in a dataset with 495 data records for the S_{Hmax} orientation. The reliability of each indicator is assessed according to the quality criteria of the World Stress Map project.

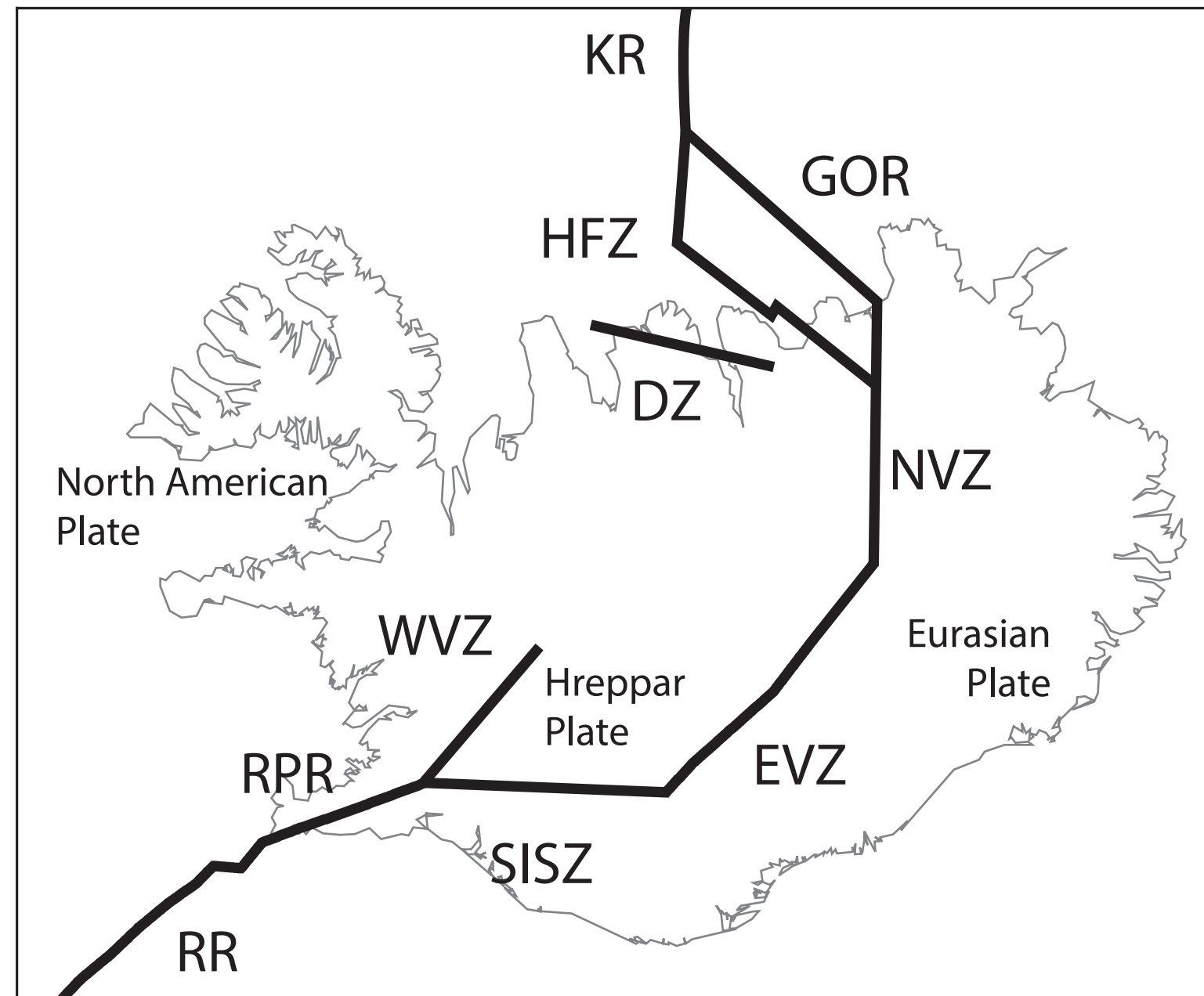
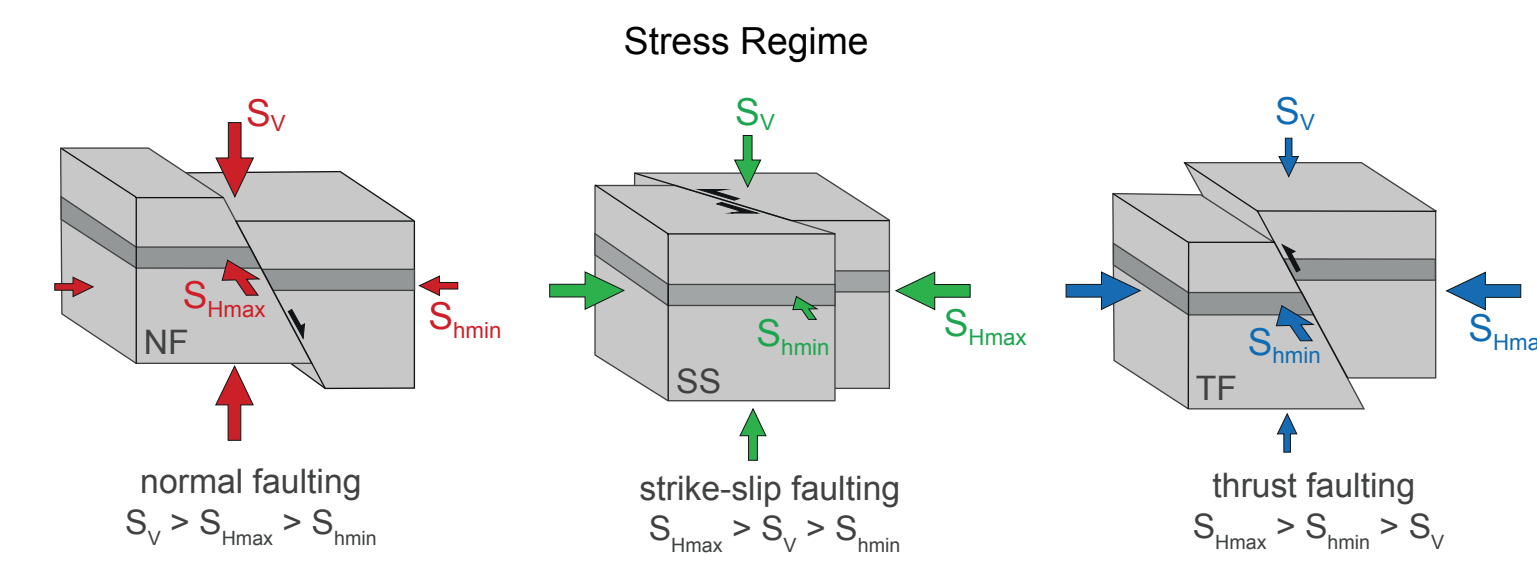
The dataset is collected under the assumption, that the vertical stress (S_v) is a principal stress, the orientation of the 3D stress tensor is defined by the orientation of the maximum horizontal stress (S_{Hmax}) only. The minimum horizontal stress (S_{Hmin}) is perpendicular to S_{Hmax} . The orientation of S_{Hmax} is illustrated by lines with different length in the map. The length of each line is a measure for the quality of the data. The symbol specifies the method and the colour indicates the stress regime. Data with the lowest quality (E) are illustrated without

any further information as a point. Used stress data are part of the World Stress Map (WSM) database release 2016 and freely available. Further information about the data, criteria, data analysis and quality ranking are located on the WSM webpage: www.world-stress-map.org.

The majority of S_{Hmax} orientation data records in Iceland is derived from earthquake focal mechanism solutions (35 %) and geological fault slip inversions (26 %). 20 % of the data are borehole related stress indicators. In addition minor shares of S_{Hmax} orientations are compiled, amongst others, from focal mechanism inversions and the alignment of fissure eruptions. The results show that the S_{Hmax} orientations derived from different depths and stress indicators are consistent with each other.

The resulting pattern of the present-day stress in Iceland has four distinct subsets of S_{Hmax} orientations. The S_{Hmax} orientation is parallel to the rift axes in the vicinity of the active spreading regions. It changes from NE-SW in the South to approximately N-S in central Iceland and NNW-SSE in the North. In the Westfjords which is located far away from the ridge the regional S_{Hmax} rotates and is parallel to the plate motion.

Method	Quality	Stress Regime
focal mechanism	A	normal faulting
borehole breakouts	B	strike-slip faulting
drilling-induced fractures	C	thrust faulting
overcoring	D	unknown regime
borehole slotter	E	
hydraulic fractures		
geological indicators		



The Mid-Atlantic Ridge and its different segments in Iceland according to Bird (2003) and Einarsson (2008). RR: Reykjanes Ridge, RPR: Reykjanes Peninsula Ridge, SISZ: South Iceland Seismic Zone, WWZ: Western Volcanic Zone, EVZ: Eastern Volcanic Zone, NVZ: Northern Volcanic Zone, HFZ: Húsavík Flatley Zone, GOR: Grimsey Oblique Rift, KR: Kolbeinsey Ridge.

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Bathymetric data from the GEBCO_2014 Grid, www.gebco.net.

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