



## Seismotectonics and triggered earthquakes in the Geysir Area in Iceland

Bergthóra S. Thorbjarnardóttir (1), Ingi Th. Bjarnason (1), and Ragnar Stefánsson (2)

(1) Inst. Earth Sciences, University of Iceland, Reykjavik, Iceland (ingib@hi.is), (2) University of Akureyri, Akureyri, Iceland

We present earthquake relocations with good relative accuracy for an extended area around the Geysir geothermal field in Iceland. Original phase data were received from the earthquake catalog of the Icelandic Meteorological Office (IMO) for the years 1995-2016, and further processed with the double-difference relative earthquake location method (Waldhauser and Ellsworth, 2000). The area encloses seismicity in a zone extending partly into the neovolcanic zone. Seismicity in the area was moderate during the years 1995 up to 16 June 2000, but became highly active (triggered) following two large earthquakes ( $M_w \sim 6.5$ ) in the South Iceland Seismic Zone (SISZ) in June 2000. The Geysir area is some 40 km north and north-northeast of the mainshocks and in strike of the fault of the earlier mainshock. The rate of seismicity tapered down in 2001, but was still higher than prior to the mainshocks. Since 2002, the earthquake rate has been moderate.

Seismic lineation suggests two main fault populations in the study area: north-northeast to northeast striking near-vertical or steeply dipping fault segments up to  $\sim 6$  km long (possibly longer, though not delineated the whole length), and less frequent east-northeast striking segments up to  $\sim 2.5$  km long, sometimes in an echelon arrangement. The east-northeast segments are also near-vertical in the depth range 4-8 km. The rifting direction in the area is  $\sim N130^\circ E$ . Right-lateral strike-slip movement has been determined on some of the north-northeast to northeast striking fault segments in the extended Geysir area, a sense of motion comparable to north-south strike-slip faults observed in the SISZ. Assuming the same stress field source, the east-northeast segments are likely to be left-lateral strike-slip conjugate faults.

The application of the double-difference relative earthquake location method to the seismicity of the extended Geysir area is highly successful in sorting out higher quality data from the local IMO catalog, and delineating seismic patterns with high resolution. Questions we would like to address: 1) Why did the 2000 mainshocks trigger seismicity in the Geysir area, but not in the nearer area between the mainshocks and the Geysir area, which is also geothermally active; 2) The majority of seismicity in the area lies at 2-8 km depth, but otherwise near to the surface ( $< 2$  km) or down to 12 km depth on some faults within the neo-volcanic zone. What is the significance of these shallow and deeper earthquakes?; 3) The steeply dipping faults dip either to the east or the west. Do the dip directions follow a system?