Geophysical Research Abstracts, Vol. 7, 04294, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04294

Migration of hypocenters of fluid induced swarmquakes in the Tjörnes-Fracture-Zone (North Iceland)

M. Hensch (1), J. Reinhardt (1) and THE NICE GROUP
(1) University of Hamburg (hensch@dkrz.de)

The Tjörnes Fracture Zone (TFZ) separates Iceland's North Volcanic Zone from Kolbeinsey Ridge (Greenland Sea). Seismicity mainly occurs in swarms (often 100 and more events per day) with similar waveforms, frequently offshore.

During the Krafla crisis in 1978, the level of seismicity increased and hypocenters propagated northwards with about 0.4-0.5m/sec. This indicated the propagation of a dyke which later on started an off-caldera extrusion. Therefore, the migration of hypocenters in North Iceland could be characteristic of the movement of magma in the subsurface. Another prime suspect for swarmquakes is hydrothermal activity; in the TFZ there are four known high temperature hydrothermal fields, two of them offshore.

We analyzed earthquake swarms between June and September 2004, recorded by 35 stations, i.e. the permanent Icelandic network and a temporary setup of land and ocean-bottom seismometers. Events occuring in the same swarm often show similar waveforms at the same station. We crosscorrelate these time series to relocate the hypocenters within the swarms and to precisely determine the direction and velocity of migration.

Our preliminary analysis of hypocenter migration shows that some of the recorded swarms indeed are propagating upwards with about 0.03-0.05m/sec and over a range of 3-7km. The remaining seismic activity clusters above these events rather than below, which is an indication that stress accumulates above ascending cracks and that no further events reactivate the recently fractured rock. This is what we expect for a rising fluid batch.