Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11538, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11538
EGU General Assembly 2008

Seismic and tsunami early warning activities in Iceland.

K. S. Vogfjörd (1), G. G. Pétursson (1), E. Kjartansson (1), R. Slunga (2), K. Ágústsson (1), S. Hjaltadóttir (1), G. B. Gudmundsson (1), M. J. Roberts (1), H. Geirsson (1) and S. Ármannsdóttir (1)

(1) Icelandic Meteorological Office, Reykjavík, Iceland, (2) Swedish Defense Research Agency, FOI, Stockholm, Sweden

As part of the Icelandic participation in the seismic early warning project SAFER, we are adapting, developing and implementing several real-time and near real-time procedures for SW Iceland. The processes will become part of the routine seismic hazard monitoring performed at the Icelandic national seismic network, SIL. These processes are:

Near-real time fault mapping.

We take advantage of our waveform library representing earthquakes on previously mapped subsurface faults through relative location methods and are developing a near-real time, relative relocation procedure for automatically located earthquakes. The relocation starts as soon as waveforms from two stations arrive at the center. The procedure can return highly accurate event locations in near-real time and makes possible the association of new earthquakes with previously mapped faults. If these earthquakes are foreshocks to a large earthquake, the fault plane of the following large event is immediately known.

Shake map.

We are designing and implementing real-time and near-real time processing tools for estmation of peak ground velocity, peak ground acceleration and earthquake source parameters. These tools will be operational at the seismic stations and will transmit information to the SIL center, to be used for the generation of shake maps for earthquakes in SW Iceland.

Real-time aftershock forecasting (STEP).

Preparations for adapting and installing STEP are under way. The forecast maps will be published on the web, where they will be immediately accessible to the public, media and emergency planners. The time dependent map generator will forecast, in probabilistic terms, the risk of strong shaking in SW-Iceland.

For inclusion in shake map, we are developing relations between Mercalli intensities and peak ground velocity (PGV) and peak ground acceleration (PGA), as well as gridding surface velocities extracted from maps of surface geology in SW Iceland. A new attenuation relation for PGV and PGA has also been derived from PGV values of 40 earthquakes with epicenters in SW-Iceland, ranging from 3.5 to 6.5 in magnitude. The formula incorporates both near-field and far-field behavior, both of which are necessary ingredients for the shake map application and the STEP model.

Crustal stresses and earthquake prediction derived from microearthquake analysis.

By relying on multievent microearthquake analysis, the high quality of the microearthquake recordings at the SIL seismic network allows accurate estimates of the full stress tensor fields. By mapping the absolute Coulomb Failure Stress for expected mechanisms for the large earthquakes along the seismic zones the method of predicting triggered earthquakes by use of stress transfer computations (Delta CFS) becomes much more reliable. For instance the triggered earthquake June 21 2000 Ms 6.6 occurred exactly at the place of largest CFS (about -0.5 MPa) along the Southern Iceland Seismic Zone (SISZ). In addition the microearthquake stresses also map nicely the areas of increased stresses, for example the June 17 2000 Ms 6.6 EQ.

Icelandic participation in the tsunami early warning project TRANSFER involves adapting for the submarine Tjörnes Fracture Zone, off-shore northern Iceland, many of the processes developed or implemented within SAFER. In addition, historic data on tsunamis in Iceland are being compiled. To date, four types of tsunami trigger have been identified: earthquakes, rockfalls, snow avalanches, and volcanogenic floods. In addition to collating spatial data on tsunami sources, work on modelling the interaction of sediment-laden floods and seawater will take place. The results of this Iceland-based research will provide valuable data for improved assessments of tsunami hazards in Iceland and the wider North Atlantic region. Furthermore we are exploring how it is possible to use high-rate continuous GPS measurements for real-time tsunami warnings. We focus on the infrastructure needed for such a system, data transfer and data processing