Geophysical Research Abstracts
Vol. 13, EGU2011-9637, 2011
EGU General Assembly 2011

Networking of Icelandic Geophysical Infrastructures

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The North-Atlantic ridge, representing the plate boundary between the European and North American plates, crosses Iceland from SW to NE. Two main transform zones are in Iceland related to the offsets of the plate boundary. In the south, the South Iceland Seismic Zone links the oblique spreading Reykjanes Peninsula plate boundary and the Eastern Volcanic Zone of Iceland. At the north coast of Iceland, activity is offset from the Northern Volcanic Zone of Iceland to the offshore Kolbeinsey Ridge by the Tjörnes Fracture Zone. In every century over the last millennium, the transform zones have generated one or more large earthquakes. In the SISZ, in particular, they occur in major sequences lasting from weeks to years, consisting of several earthquakes of magnitudes of up to M7.3. A major earthquake sequence is presently on-going in the SISZ since year 2000. In the rift zones the earthquakes are smaller, but volcanic activity is high, with several recently active volcanoes and associated fissure swarms generating about two eruptions per decade. The latest eruption occurred in 2010 at Eyjafjallajökull volcano. This eruption produced a fine-grained ash plume, which was dispersed with tropospheric winds over most of northern Europe causing repeated massive disturbance to air traffic.

Iceland participates in the EPOS infrastructure project, contributing its geophysical networks to the pan-European infrastructure. The geophysical infrastructure, monitoring seismic and volcanic activity in Iceland, is operated by four different institutions. The national seismic system, SIL, monitoring seismic and volcanic activity is operated by the Icelandic Meteorological Office (IMO). The strong motion network, monitoring large earthquakes in the seismic zones, is run by the Earthquake Engineering Research Centre (EERC), with a few additional accelerometers operated by IMO. GPS networks recording plate motions, displacements in large earthquakes in the SISZ, and expansion and deflation of volcanoes in the rift zones are operated by three institutions: IMO, the Institute of Earth Sciences (IES), and the National Land Survey of Iceland (NLSI). A bore-hole strain meter network is operated by IMO in southern Iceland to monitor large earthquakes in the SISZ and magma movements in Hekla volcano. The GPS systems are mostly networked already, while real-time data streaming between EERC and IMO of selected strong motion sites is commencing in 2011, within the Infrastructure project NERA. The strong motion data will improve IMO's present real-time ShakeMaps to enable the generation of accurate, unsaturated ShakeMaps for large earthquakes in Iceland. The ShakeMaps will be immediately available at the IMO and EERC web sites to assist in real time disaster response. Through the preparatory phase of EPOS, the networking, processing and geophysical data archival at the national level will be harmonized.