Geophysical Research Abstracts, Vol. 7, 06955, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06955

Seismicity changes in the SISZ, Iceland: Plate tectonics or inter-event triggering?

S. M. Richwalski (1,2) and F. Roth (1)

(1) GeoForschungsZentrum Potsdam, Potsdam, Germany, (2) Center for Disaster Management and Risk Reduction Technology / Universitaet Karlsruhe (TH) and GeoForschungsZentrum Potsdam, Karlsruhe, Germany (richw@gfz-potsdam.de, +49 331 2881205)

Chronicles of past events in the South Iceland Seismic Zone (SISZ) date back to the colonisation of the island and from the beginning of the 18th century on, relatively reliable damage descriptions allowed to conclude that earthquakes occur fairly regularly and hardly ever as single events (Einarsson et al., 1981, in: Earthquake Prediction ÍC An International Review by Simpson and Richards). All events occur as NS-oriented right-lateral strike-slip events and it was observed that in most cases the subsequent events of a series (with time-lags of only a few days between the events) occurred farther and farther west. There are several possible contributors to these observations: constant stress build-up by plate motion, stress transfer caused by previous earthquakes, and post-seismic stress relaxation. To understand the role of stress transfer in the framework of the PREPARED project we modelled 13 major events from 1706 until 2000 (using the software described by Wang et al., 2003, Computers & Geosciences and Lorenzo-Martin et al., 2002, Fisica della Tierra) following the ideas of Roth (2004, PAGEOPH). The software can treat a mixed elastic/inelastic layered half-space model, such that post-seismic stress relaxation is included. Lateral crustal variations had to be neglected, as was stress induced by volcanic activity. Uncertainties in the fault plane parameters were not considered. Our results indicate that the pre-event shear stress level at 5 km depth for each rupture reached its maximum in about 50% of the cases before the event. Often, higher values appear for the rupture much earlier in time, indicating that the fault should have ruptured much earlier. Interestingly, the pre-event stress level for the first event of a series reached its maximum in 60% of the cases. Concerning triggering of events by Coulomb stress changes, we find that apart from one subsequent event always more than 50% of the rupture shows

values of at least 0.01 MPa and the event can therefore be considered triggered by previous events inside its series. All first events in a series have too low values to be triggered by the previous series. In summary, at hindsight we may explain the occurrence of earthquakes in the SISZ in terms of mainshock-aftershock triggering, while stress build-up by plate motion seems to be the driving force for releasing the first event of each series. However, given the uncertainties in the data and the restrictions for modelling, we are unable to make a prediction about locations of future earthquakes.