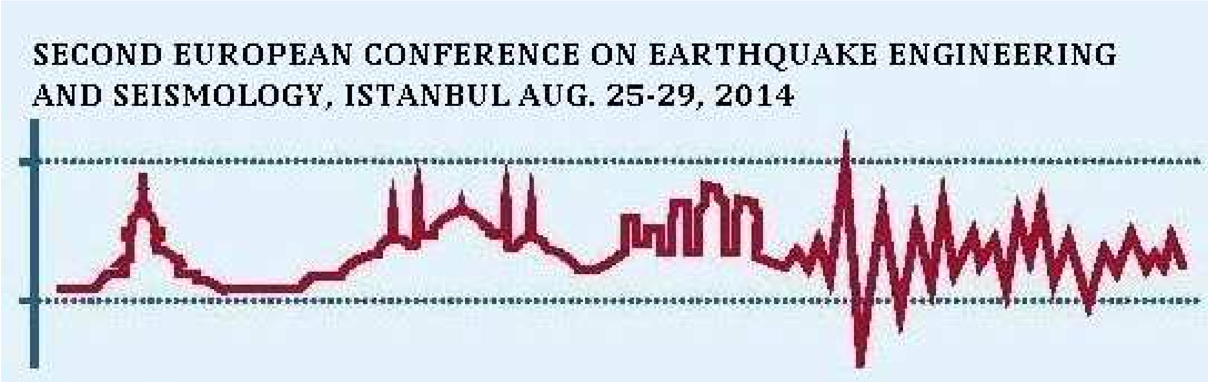

SHORT-TERM SEISMICITY FORECAST EXPERIMENTS IN SOUTH ICELAND

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Several natural laboratories exist in the World to test earthquake forecast hypotheses and these are all grouped in the Collaboratory for the Study of Earthquake Predictability (CSEP) project. The Icelandic Meteorological Office, as a member of the REAKT (Strategies and Tools for Real Time EArthquake RisK ReducTion) project, which aims to improve the efficiency of real-time earthquake risk mitigation, is prototyping an Operational Earthquake Forecasting (OEF) system in the Icelandic natural laboratory.

We have chosen a testing area that includes the South Iceland Seismic Zone and Reykjanes Peninsula, where historical seismicity in the last several centuries is well-studied, and most major faults here have been mapped in 3D. The earthquake catalogue that we intend to use spans the period from 1991 until September 2013 and contains 205,015 earthquakes with magnitudes raging from 0.0 to 6.5. To improve the quality of the selected catalogue a filter using the criteria proposed by Gomberg et al. (1990) and Bondar et al. (2004) was applied. The resulting catalogue contains 130,214 earthquakes. Particular attention was paid to in magnitude estimates, because in the SIL catalogue two methods are used. The first method is based on an empirical local magnitude (M_L) relationship. The other magnitude scale is a so-called "local moment magnitude" (M_{LW}), originally constructed by Slunga et al. (1984) to agree with local magnitude scales in Sweden. We calibrated a relationship to convert M_L in moment magnitude (M_W) through orthogonal linear regression. Another problem in the catalogue that we found concerns the magnitude of immediate aftershocks of large events which are often assigned magnitudes that are too high. To solve the problem related with the overestimation of aftershock magnitude of large earthquakes about 150 earthquakes were checked manually. After this analysis the *b-value* in South Iceland seismic zone and Reykjanes peninsula was estimated and appears to be 0.85. The M_C (magnitude of completeness) value is 0.91, which demonstrates the good sensitivity to small earthquakes in the SIL network. The *b-value* and magnitude of completeness (M_C) for the investigated catalogue was studied using the Gutenberg–Richter law. In particular, M_C was obtained using maximum curvature method (Wiemer and Wyss 2000), whereas *b-value* are computed using the maximum likelihood method (Utsu 1965). Our findings demonstrate the importance of carefully checking the catalogue before proceeding with operational earthquake forecasting.

Using the corrected catalogue, we have conducted a series of next-day seismicity forecast experiments in the Iceland natural laboratory. In these experiments we have applied the well-known clustering models STEP and ETAS and some simpler reference models that do not model short-term spatial clustering. We use likelihood measures to compare and check the forecasts throughout the experiments. We also use variants of these models that are updated more regularly than e very 24 h, and we explore whether this "near-real-time" mode demonstrates a substantial improvement in model performance. In addition to the individual models, we present results related to ensemble models convex linear combinations of the individual models. The weights used to construct ensemble models are derived from model performance and, by looking at the time-varying evolution of these weights throughout our experiments, you can see how dynamic/unstable comparative model performance can

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be. In this presentation, we will also report on the computational feasibility of Operational Earthquake Forecasting in Iceland.

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