2008 SCEC Annual Report

CSEP Forecast Test Methodology: Development and Participation

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Funding for this grant was provided at a level that targeted travel expenses so that David Rhoades and Matt Gerstenberger could attend SCEC and CSEP related meetings throughout the year. The work presented in these meetings was related to ideas discussed in the proposal, CSEP related topics, or to previous SCEC funded work. Additionally, both researchers participated in multiple discussions related to CSEP development.

An itemization of meeting attendance is as follows:

Seismological Society of America, 2008 meeting, April 2008

Gerstenberger cochaired a special session on CSEP and earthquake forecasting and also presented an update of the status of the New Zealand testing center.

CSEP Global Collaboration & Testing Meeting, Monday, April 21, 2008

Rhoades attended this one-day workshop held at the SCEC Headquarters in Los Angeles and presented a "Status report on the New Zealand Testing Centre and New Zealand CSEP efforts".

SCEC Annual Meeting, Palm Springs, September 2008

Rhoades presented a poster entitled "Long-range earthquake forecasting allowing for aftershocks", which describes a new version of the EEPAS (Every Earthquake a precursor According to Scale) model to allow for aftershocks of predicted events. The model gives an improvement of about 0.1 in the information rate per earthquake (the change in log likelihood divided by the number of target earthquakes) when applied to the California CSEP testing region at $M \geq 5.0$. The model is also described in detail in a SCEC publication (Rhoades, accepted). The new model will be submitted to the SCEC testing centre in 2009.

After the SCEC meeting David Rhoades spent two days visiting Danijel Schorlemmer at USC, to discuss CSEP-related matters, and to begin preparation of a paper describing efficient versions of the N-test, L-test and R-test, which have already been partially adopted in the latest versions of the CSEP software, with signification savings in processing and storage

Visit to CSEP & Danijel Schorlemmer, October 2008

Gerstenberger spent 10 days visiting D. Schorlemmer and CSEP at USC working on various issues related to operations of the New Zealand Testing Center and model development. Much of this time was spent with M. Liukis working on specifics related to the installation of a new version of the CSEP testing center operational code on the testing center computers in New Zealand.

IASPEI 2009 Assembly, Cape Town, January 2009

Rhoades was co-convener of a session on "Prospective Testing on Earthquake and Faulting probability Models", and gave a talk on "Mixture models for improved

earthquake forecasting", describing recent work on combining the STEP and EEPAS models for improved short-term forecasting, and on mixtures of EEPAS models with different parameters for improved medium-term forecasting.

New Zealand Testing Centre progress

Good progress has been made in the installation of submitted models to the New Zealand Testing Centre. Thirteen models are installed in the testing centre and are being tested; approximately 6 additional models are in the queue to be installed. The five-year and three-month classes contain multiple models and the one-day class will contain two after the ETAS model is installed; this process is currently underway. The testing centre is currently operating in an unofficial capacity and official testing will begin once earthquake catalogue quality issues are resolved by GeoNet who is providing the certified catalogue.

Other Activities

Throughout the year, Matt Gerstenberger intermittently participated in weekly CSEP teleconferences

The EEPAS software installed in the CSEP testing center was found to contain a minor bug, affecting the five versions of the EEPAS model installed last year. The corrected software has now been installed. For continuity, the old versions of the model will still be tested alongside the new ones.

A combined STEP+EEPAS forecasting model (Rhoades and Gerstenberger, 2009) is ready for installation in the SCEC testing centre as a one-day model, as soon as a bug in present STEP software has been eliminated.

SCEC Publications

Rhoades, D.A. and Gerstenberger (2009), M.C. Mixture models for improved short-term earthquake forecasting. Bulletin of the Seismological Society of America, 99(2A), 636-646.

Gerstenberger, M.C. and Rhoades, D.A. (in revision). New Zealand earthquake forecast testing centre. Pure and Applied Geophysics.

Rhoades, D.A. (accepted). Long-range earthquake forecasting allowing for aftershocks. Geophysical Journal International.