The Collaboratory for the Study of Earthquake Predictability (CSEP) Testing Center Development at SCEC

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Objectives

- Establish rigorous procedures for registering and evaluating prediction experiments.
- Construct community standards and protocols for comparative testing of predictions.
- Develop an infrastructure that allows groups of researchers to participate in prediction experiments.
- Provide access to authorized data sets and researchers to participate in prediction experiments.
- Accommodate experiments involving fault systems in different geographic and tectonic environments.
- Reduce the controversy surrounding earthquake prediction through a collaboratory infrastructure to support a wide range of scientific prediction experiments.
- Promote rigorous research on earthquake predictability through the SCEC program and its global partnerships.
- Help the responsible government agencies assess the feasibility of earthquake prediction and the predictability through the SCEC program and its global partnerships.

Goal

- Support a wide range of scientific prediction through a collaboratory infrastructure to promote rigorous research on earthquake predictability through the SCEC program and its global partnerships.
- Establish rigorous procedures for registering and evaluating prediction experiments.
- Construct community standards and protocols for comparative testing of predictions.
- Develop an infrastructure that allows groups of researchers to participate in prediction experiments.
- Provide access to authorized data sets and researchers to participate in prediction experiments.
- Accommodate experiments involving fault systems in different geographic and tectonic environments.
- Reduce the controversy surrounding earthquake prediction through a collaboratory infrastructure to support a wide range of scientific prediction experiments.
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System Infrastructure

- Code repository
- Model repositories
- Integration system
- Operational system
- External storage
- Web server
- Development system
- Models
- Catalog data
- Results

W. M. Keck Testing Center at SCEC

The initial implementation of the CSEP Testing Center for the California Natural Laboratory became operational on September 1, 2007 at SCEC/USC and is designed to evaluate forecasts stated in terms of seismic rate per latitude/longitude/magnitude bin. The SCEC Testing Center performs prospective forecast testing with a 31-day waiting period for the test date to guarantee integrity of the input catalog data.

Forecast Models
- 2 one-day models (STEP, ETAS)
- 7 three-month models (EEPAS, PPE)
- 19 RELM five-year models

Authorized Data Set
- ANSS Catalog
- CMT Catalog

Evaluation Tests
- RELM N (number of events) test
- RELM L (log-likelihood) test
- RELM R (log-likelihood ratio) test

Processing Schedule
- One-day models: daily
- Five-year models: monthly
- Three-month models: bi-weekly

Automated end-to-end processing

Full Reproducibility
The testing center keeps:
- All input data (earthquake catalogs, parameter files)
- All simulations (seed values of random numbers)
- All results
- System and software configurations used for computations (metadata)

Current Software Development

- Optimization of RELM evaluation tests
- Migration of (Matlab) catalog filtering to Python
- Storage Python module to re-use existent data
- Batch Processing: Python module to re-process testing dates
- Introduction of Western Pacific testing region

Software Stack

The CSEP system provides a controlled integration environment with a standardized software stack for developing and installing forecast models:
- Linux
- MPICH2
- GCC, G77/gfortran
- Python
- R (Matlab)
- Eclipse [Integrated Development Environment]
- Subversion [Source repository]
- CruiseControl [for continuous build process]
- Trac [for project management]

Multiple Web Presentations

CSEP General Webpage

CSEP US Webpage

CSEP Formats
- Earthquake Catalog Format
- QuakeML
- SEP Formats
- Test Results
- Forecast
- Grid

SCEC Testing Center Results

Please visit our web page: http://us.cseptesting.org/ScecResults (login name and password are required)

Development organization

CSEP Software is released under open-source licenses and being validated and distributed to other earthquake forecast testing facilities outside of California. We host the XML definitions, the software core, and the scripts for Natural Laboratories hosted in our center. We provide unlimited downstream and moderated upstream of codes.

Example

CSEP Development Team

Natural Laboratory Code

Python Core

Natural Laboratory Code

XML Definitions and API

Testing Centers

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