KICKOFF

WORKSHOP

"The Italian testing region for earthquake forecasting experiments within CSEP"

Place: Rome (INGV Conference Hall - Via di Vigna Murata 605)
Date: 27-28 October 2008

Organizers: Warner Marzocchi INGV Rome, warner.marzocchi@ingv.it) - WM
Stefan Wiemer (ETH Zurich, stefan.wiemer@sed.ethz.ch) - SW
Danijel Schorlemmer (USC, Los Angeles, ds@usc.edu) - DS

Sponsored by INGV and NERIES project

Monday, 27. October 2008

11:00 Introduction to the workshop by (T.Jordon TJ, WM)

********* The CSEP project (Chairman: TJ)**

11:15 CSEP – Concepts, implementation, and progress (DS)

- CSEP Computer System: see Presentation DS)
- Restricted access to the results on www.cseptesting.org
- Community Standards: see Presentation DS
- Communication Protocols: Weekly minutes posted on CSEP website
- Time line of CSEP testing center. Overview over different development steps during last years. California is running, NZ Testing Center operational, Japan Testing Center operational 09/01/08,
- Road map: Version 9.1 with Multi-Testing Center distribution
- 1 April 2009 : European Testing Center based on Version 9.4

Discussion & Questions (D&Q):

- Do we have same software for all testing center (WM)?
  DS: Separate local code with configurations (download links, etc.) from generic CSEP code during upgrade.
- Stefan: New model in California? available for other testing center?
  Contact California Testing Center stuff
- Zhuang: Submitting Black boxes?
  Rules of the game is that model should be open source
- Max: similar question. Access of researchers to computer to install black box type software.
  So far no intention, focus or efforts on this issue. Black box: misleading idea to forecast earthquake may be distributed.
- Statement of DS and TJ: code should be available.
  SW: CSEP should work towards modelers. How good should a model be for CSEP..?

11:45 CSEP testing center in Europe (SW)

- Mentioned exchange between US and Europe in 2006.
- Testing Center for whole Europe to difficult. Back to small national network level.
- Continuity is needed for testing and available by a „Memorandum of Understanding“ (MoU) by ETH and INGV.
- Model developers should read MoU
- Testing center in Europe can carry different testing regions
- Creating of Board of Directors
- Access to results should be spelled out very clearly
- Possible new testing regions with representatives are participating at this meeting:
  - Iceland
  - Turkey (Mine)
  - Greece
- CSEP is not a policing exercise or gambling exercise, but a scientific exercise

D&Q:

- WM: Discussion of policy of releasing reports / results is very important. Suggest independent rules for each testing region. There will be a discussion later that day and is one of the core of this meeting.

12:10 The technical implementation of the CSEP testing center in Europe & Italy (F.Euchner, FE)

- Talk interesting for model developers.
- Developing Team (see presentation)
- New Zealand testing center uses quakeML format. This could be interesting for other testing centers / regions.
- Catalog Format can be find in the presentation
- Which information does CSEP provide for forecast creation? - See presentation

D&Q:

- WM: Do we (model developers) have assistance for model submittion?
  FE - Yes. there is.
  TJ – Model developers at CA Testing Center spend significant time to assist.
  DS – Problem is more that models do fulfill forecast format than data format.
- Unknown: Question about time of providing data?
  Data supply will be defined by testing regions.

12:30 LUNCH

********* Testing and validation (Chairman: DS)**

13:50 Implementing tests in the CSEP testing center software (J. Zechar, JZ)

Covers:

- Molchan trajectory
- Requirements for new test

- Process for new test implementation

D&Q:
- WM : What is the advantage of Molchan trajectory and ASS?
  ASS is a value, Molchan trajectory a function
- K. Nanjo: Difference between Molchan and ROC diagram?
  Molchan: Choose reference model, ROC not

14:10 First results of the RELM experiment (DS)
- Information on RELM experiment
- 11 target earthquakes in RELM
- Conclusions on RELM results by round robin of the different models (see presentation)
- 1-Day models: Results of STEP and ETAS model. STEP code has difficulties in forecasting events for Baja Swarm (see presentation).
- Summary:
  - Meaningful results are available.
  - Successful standardization and consensus
  - Manuscript available on 2.5 years result on the website

D&Q
- S. Hainzl: How was declustering performed?
  DS: We have followed a pragmatic approach and have used the declustering most modelers applied, i.e. Reasenberg declustering. MCS of declustering parameters over certain parameter space.
- WM: Two options: no declustering or avoid declustering at all
- SW: How good is good (model)? Is there a measure?
  DS: The models are compared to each other and therefore a statement on the quality is a relative one. But probably Agne's model will be future reference model.
- Unknown: National hazard map implemented?
  DS: Difficult to implement, but this would be desirable.

14:20 Open questions in testing procedures (M. Werner, MW)
- Goal of testing is to improve earthquake model
- 1-slide summary of 5-year RELM forecast (see presentation)
- Assumptions of RELM tests (see presentation)
- Suggest points for discussion
- MW, suggests to move away from grids and allow conditional probability forecasts

D&Q
- There are models that would use conditional probabilities within the testing center. DS mentions that the community should think about available tests and making testing for this sort of models would require a significant effort

14:30 The interaction between CSEP validations and seismic hazard (S. Wiemer, SW)
- 2-Slide presentation
- Seismic hazard on different scales (national, continental, worldwide)
- CSEP and Hazard (see slide in presentation)

D&Q

- TJ: Problem: national seismic hazard maps are not testable.
  SW: USERVE and GEM bring CSEP and hazard maps close together. Work is going on.
- Max Wyss: Existing faults and big future earthquake do not always go together, i.e. Denali earthquake
- K. Nanjo: Early warning and testing?
  SW: Tests should be run by early warning people

******** the Italian testing region (Chairman: D. Schorlemmer, DS)**

14:40 The Italian testing region: the bulletin and seismic network (F.Mele)

- Numbers of stations significantly increased during last years due to collaboration with civil protection and neighboring countries.
- Data are now available digital and real-time.
- Change in magnitude computation in 2005-Apr-16
- Extensive magnitude of completeness (see presentation).

D&Q:

- Papadopoulus: Is there a correlation computed between the two different types of magnitude calculations?
  FM: This, we have planned
- Max Wyss: Bias with magnitude calculations (Ms vs Ml)? This is a problem. Difference up to 0.5.
  Massimo: suggest problem with Ms than for Ml
  Max Wyss: mean difference between magnitudes of USGS and INGV of 0.6!
- Unknown: homogeneity of magnitude in catalog is discussed. It is not clear how to use the data with such variations?
- WM: suggest, to pick up this topic during discussion.

14:40 The Italian testing region: the completeness magnitude in space and time (DS)
Introduce probabilistic magnitude of completeness (pMc) for the time after the network change (see presentation). Have a look at www.completenessweb.org .

D&Q:

- SW: Testing area is extending far to neighboring region, this should be discussed!
- TJ: would you assess uncertainties in hypocenter locations?
  DS: Should be implemented. People are working on this topic.

14:40 The Italian testing region: the rules of the game (WM)
Rules are distributed or see presentation

15:30 COFFEE BREAK

15:50 Discussion: How do we structure testing in Italy? Access to models, data, results publication policy, testing periods, etc.

1. Models outside of the testing center?
   WM: No models outside the testing center.
   SW: Long term model, i.e. national hazard model, may be submitted by a certain date.
   J. Zhuang: to who belongs the model after submission to the testing center?

WM: There should not be a problem with authorship of the models due to publications.
Unknown: Can model developers have access to change / update stochastic model after submission.
WM: No.
DS: Models with fixed numbers have a strict deadline
Issue of Black Box and proprietary codes: TJ: take the executable with David Rhodes code, author can not change it.
Massimo: Code from „Unknown“ belongs to a public and they also profit by the comparison.
DS: Are result tables or numbers allowed to submit?
Unknown: There is a need to submit tables and numbers with the forecast.
WM: Some models may need additional data feeds and this models need to submit result tables.
WM: Best solution is, that some model developers may submit tables. Intermediate or short term are preferred to be open source.
Massimo: Need for „controlled conditions“

3. The forecast will be based on a regular grid?
   MW asks to be more flexible with the regular grid. Eventually interest in continuous intensity forecasts? Yes, there is.
   There should be resources to look for continuous forecasts, if there is a need for it.

   National / political boundary:
   Conclusion: We go on with the same data collection region. Publication are restricted to the national / country boundary.

   Faults should be discretized to the grid.

4. *The forecasts have to be made for the whole area:*
   Suggestion by WM: for partly forecasts the reference model can be used in nodes / grid area that is not covered by the forecast model.
   DS mention the option of masking.
   Conclusion: It is modelers choice to choose for the „backup model“

5. *Each forecast consists of a seismic rate for each magnitude bin in each cell and the defined time window, The forecast covers the entire cell area:*
   Forecast rate, forecast distributions, and binary predictions should be possible. At the moment, there are no objections against rates.

***** Examples of models to be tested (Chairman: SW, WM)**

16:45 The Italian seismic hazard map (C. Meletti)

D&Q:

- SW Are you comfortable to put this model in CSEP testing center?
  WM: yes,

17:00 Physical and statistical models for earthquake clustering (R. Console)

D&Q:

- S. Hainzl: Are there data available for slip models?

DS: Slip distributions from an independent source. It is not fully sure that it will be available. Focal mechanisms are available in CSEP.
Massimo: Coulomb model are not yet ready for CSEP.

17:15 RTP Algorithm and the results of its 4-years test in Italy (P. Shebalin)
P. Shebalin wants to send RTP to CSEP. Algorithm is yet not completely automatic. In a few month, automatic version should be available. Algorithm have to be adapted to the region.

17:30 Earthquake complexity: impact on historical seismicity, seismogenic source, databases, and earthquake forecasting (G. Valensise)

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09:15 The algorithm FORMA (foreshock-mainshock-aftershock): testing in Greece and possible testing in Italy (G. Papadopoulus, GP)
- FORMA need good quality data. Code is written in C++.

D&Q:
- WM: Technical question: Can the code be run in other regions. Can it be installed by April 1, 2009?
- GP: Code can be installed and can run in stand alone modus. Forecasts are not available by April 1, but 3 month later.
- Max Wyss mention the desire to include a Greece testing region.
- SW: Would Greece be ready in a few years to set up a testing region?
- GP: In principal, yes. GP is very positive to start.

09:30 ALM model for Italy (L.Gulia) given by SW

09:45 Double Branching model for Italie region (A.M. Lombardi, AML)

14:15 How can we test precursory quiescence within CSEP? (M.Wyss)
CSEP should be opened up to this kind of combined models (PSQ, RTL, Mean Magnitudes, Foreshockes, etc)

10:00 STEP & ASTEP Italy (J. Woessner JW and A. Christophersen)

D&Q:
- WM: Would it be useful to submit several STEP models with different parameters?
- JW: Derive specific parameters for each region. Would not use generic parameters for different.

10:15 Next-day smoothed seismicity + ETAS forecast ; ensemble models (M.Werner)
Long term model should be ready next spring.

10:30 RI/PI models (K. Nanjo)

10:30 Uncertainties in Probability of Occurrence from characteristic Earthquakes and its Impact on the Ground Motion Hazard in the Central Apennines, Italy (A.Akinci)

11:00 COFFEE BREAK

11:30 An Earthquake rupture Forecast Model for central Italy (B. Pace)

11:45 The database o f the individual seismogenic sources (DISS) and its use on probabilistic earthquake forecasting (R. Basil)

12:00 Local Likelihood ETAS models for the seismicity in the Italian Regions (J. Zhuang)

Earthquake forecasting through the hybrid zone less approach (H.Chan)
HC can provide a table for certain magnitude ranges by April 2009

12:30 LUNCH

14:00 The ongoing experiment with fully reproducible intermediate-term middle range earthquake predictions by CN and M8S algorithms: five years of the real-time testing in Italy (A. Peresan)
see results on the following website:
http://www.ictp.trieste.it/www_users/sand/prediction/prediction.htm
This model uses NEIC data, because it needs data back approx 20 years. The desire for longer, homogeneous catalog exists.

******** *Final keynote and closing remarks*
14:30 Discussion and summaries of the reporters
Road map and responsibilities (WM, SF, DS)

4. *Forecast have to be made for the whole area.*
   - Not only. Not forecasted areas can be replaced by a reference model (maybe by choice of modeler)

5. *Each forecast consists of a seismic rate for each magnitude bin in each cell and the defined time window*
   - alarm based models are allowed
   - P. Shebalin indicate the problem of country boundary (edge effects)
   - Tests should be defined before as the rules of the game and requirements for the modelers are.
   - Documents for test evaluation are available on the web.
   - New tests may come later on

6. *The time window is set to 1 day, 1 year, and 5 years*
   P.Shebalin does not understand why we have so many time windows (1 day, 1 year, 5 years)
   - Discussion about time intervals for testing. CSEP should run on longer time scale.
   - NZ and US have 1 day, 3 month, and 5 years. Japan is going for 1day and 1 year.
   - are more than 3 terms possible?
   - 5 and 10 years can provide tables / 1day and 3 month only codes

- To many classes may cause problems (to few models per class)
- Decision:
    - 1 day with M4.0+
    - 3 month with M4.0+
    - 5 and 10 years with M5+ and optionally M5.5 (tables)

7. *The minimum magnitude fore forecasts is 4.0 and 5.0?*
   - goes together with question 6.
   - Italy has not enough 5.5+ earthquake to test within 5 years.
   - if we increase M fault based models can be included
   - approx. 10 events of M5+ in 5 years
   - with M 5 there can not be made decision in 5 years, because there are too few events.
   - Suggestion to go global with forecast for M5.5+

8. *The duration of the experiment is 5 years*
   given above

9. *Each year an official report of a RELM / CSEP scientific committee will be released with partial results. This is the only moment in which the results of the experiment will be made public*
   - Any modeler can see the results
   - there will be a disclaimer for users
   - there will be a regular report
   - there will be a delay for the calculation in the testing center. It runs in real-time with timely delay.
   - no objections from the audience.
   - the codes, forecasting results and tables will not be give away. Will presented on the website.

10. *The suite of tests adopted for ranking the models will be the same adopted in other SEP testing centers*
    given above

11. *Data for learning phase*
    - CPTI catalog : historical catalog
    - CSI catalog : instrumental catalog
    - DISS : Fault database

    CSEP provides general quality assessments on these three catalogs

12. *Grid 0.1 by 0.1 degree*
    S. Hainzl would prefer 0.05-grid
    Conclusion: Modelers should calculate on 0.05-grid, if they need, but afterwards adjust the result to 0.1-grid

16:00 COFFEE BREAK

**** Workshop closure