EUROPEAN CENTER FOR GEODYNAMICS AND SEISMOLOGY

ECGS Workshop 2012

EARTHQUAKE SOURCE PHYSICS ON VARIOUS SCALES

---- OCTOBER 3-5, 2012 ----

- Scientific Program -

Tuesday October 2

16:00 – 18:00 Registration
18:00 – 21:00 Icebreaker

Wednesday October 3

08:00 – 09:00 Registration

09:00 – 09:20 Welcome addresses

Morning session 1: Seismic Observations and Scaling on a Variety of Scales

09:20 – 10:00 Walter, W.R., R. Gok and K. Mayeda **(keynote)**

Investigating earthquake scaling using spectral ratios and simple earthquake models

10:00 – 10:20 Abercrombie, R. E.

Is the ongoing earthquake scaling controversy simply a matter of different modeling approaches and underestimated uncertainties?

10:20 – 10:40 Mayeda, K., L. Malagnini and S.-H. Yoo

The apparent stress controversy: Does earthquake self-similarity hold and who cares?

10:40 – 11:00 Coffee break

Morning session 2: Seismic Observations and Scaling on a Variety of Scales

11:00 – 11:20 Kwiatek, G., G. Dresen, M. Bohnhoff, R. Harrington, E.-M. Charalampidou, F. Bulut, Th. Goebel and B. Orlecka-Sikora

Source scaling relations of km- to cm-scale (Mw 4 to -6) earthquakes: Experiences from mining- and fluid-induced seismicity, volcanic-hybrid seismic events and laboratory experiments

11:20 – 11:40 Harrington, R.M., G. Kwiatek and S.C. Moran

Volcanic seismic earthquakes at Mount St. Helens exhibit a constant seismically radiated energy per unit size

11:40 – 12:20 Prieto, G.A., S.A. Barrett and G.C. Beroza **(keynote)**

Earthquake source physics at various depths, energy budget and scaling

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12:20 – 14:20 Lunch

Afternoon session: Seismic Observations and Scaling with Focus on Great Earthquakes

14:20 – 14:40 Baltay, A.S., S. Ide and G.C. Beroza

Radiated energy of recent great earthquakes

14:40 – 15:00 Rivera, L. and H. Kanamori

Very long period source characteristics and radiated energy of large earthquakes

15:00 – 15:20 Duputel, Z., H. Kanamori, V.C. Tsai, L. Rivera, L. Meng, J.-P. Ampuero and J.M. Stock

The 2012 Sumatra great earthquake sequence

Wednesday Poster Session

15:20 – 16:00 Poster introductions (1 slide / 1 min per poster)

16:00 – 18:00 Poster session and coffee

Debate

18:00 – 19:00 **Source scaling: Same dataset, different answer – What's going on?!**

Thursday October 4

Morning session 1: Stress drop variability, earthquake scaling and implications for ground motions

08:00 – 08:40 Abrahamson, N. **(keynote, invited)**

Incorporating earthquake source physics into ground motion models for seismic hazard studies

08:40 – 09:20 Archuleta R.J., F. Cotton, M. Causse and J. Crempien **(keynote)**

Stress drop variability

09:20 – 09:40 Hauksson, E. and L.M. Jones

Understanding earthquake scaling in the context of complex fault systems and crustal geophysics

09:40 – 10:00 Oth, A.

Stress drop and scaling variations in Japan: what is the driving mechanism?

Thursday Poster Session 1

10:00 – 11:00 Poster session and coffee break

Morning session 2: Stress drop variability, earthquake scaling and implications for ground motions

11:00 – 11:20 Gusev, A.A.

Flat acceleration source spectrum is an ordinary property of stochastic self-similar earthquake fault with propagating slip pulse

11:20 – 11:40 Cocco, M. and E. Tinti

Stress drop variability and dynamic fault weakening for extended earthquake sources

11:40 – 12:00 Mai, P.M.

Uncertainty Quantification in Earthquake Source Studies: The SIV Initiative and its Implications for Source Parameter Estimation

12:00 – 14:00 Lunch

Afternoon session – Earthquake source scaling

14:00 – 14:20 Funning, G.J., Weston J., Ferreira A.M.G., Elliott J.R. and B.E. Parsons

Earthquake scaling relationships estimated from a 20 year catalog of source models derived from InSAR data

14:20 – 14:40 McGuire, J.J., J.A. Collins, P. Gouédard, E. Roland, D. Lizarralde, M.S. Boettcher, M.D. Dehn, Y. Liu and R.D. van der Hilst

The scale dependence of rupture barriers

14:40 – 15:00 Ide, S.

Modeling scale-invariant heterogeneity of earthquakes

15:00 – 15:20 Ellsworth, W.L. and K. Imanishi

Gutenberg-Richter breakdown and the smallest earthquakes at the San Andreas Fault Observatory at Depth

Thursday Poster Session 2

15:20 – 16:00 Poster session and coffee break

Debate

16:00 – 17:00 open to suggestions from workshop participants

17:15 **Social program & conference dinner**

Friday October 5

Morning session 1: Earthquake source dynamics – modeling results and constraints from the laboratory

08:00 – 08:40 Lapusta, N. **(keynote)**

Long-term behaviour of fault models with enhanced co-seismic weakening: Importance of earthquake nucleation

08:40 – 09:20 Di Toro, G., S. Nielsen, E. Spagnuolo, S. Smith, M. Violay **(keynote)**

Friction during earthquakes from rock deformation experiments

09:20 – 09:40 Nielsen, S., E. Spagnuolo, S. Smith, M. Violay, G. Di Toro

An attempt to reconcile friction experimental measurements with seismlogical observations

09:40 – 10:00 McLaskey, G.C., B.D. Kilgore, N.M. Beeler and D.A. Lockner

Earthquake nucleation: stressing rate affects foreshock occurrence and minimum earthquake size

Friday Poster Session 1

10:00 – 11:00 Poster session and coffee break

Morning session 2: Earthquake source dynamics – modeling results and constraints from the laboratory

11:00 – 11:20 Malagnini, L., I. Munafo, M. Cocco, S. Nielsen, E. Spagnuolo, S.-H. Yoo and K. Mayeda

Friction on faults and scaling laws: Hypotheses, dynamic models, and comparisons against lab experiments

11:20 – 11:40 Ziv, A.

Using a constitutive friction law to constrain co-seismic slip: the 2004 Parkfield example

11:40 – 12:00 Niemeijer, A., C. Collettini, S.A.F. Smith and C. Spiers

Frictional properties of Zuccale Fault rocks from room temperature to in-situ conditions: the effect of temperature and fluid pressure on slip stability

12:00 – 12:20 Zhu, W. and A. Ougier-Simonin

Failure mechanisms and instabilities associated with slow slip events

12:20 – 14:20 Lunch

Afternoon session: Earthquake source dynamics – modeling results and constraints from the laboratory

14:20 – 14:40 Chiaraluce L., L. Valoroso, R. Di Stefano, D. Piccinini, L. Scognamiglio, E. Tinti and M. Cocco

Rupture nucleation and onset of dynamic propagation: new clues from the 2009 L'Aquila Earthquake

14:40 – 15:00 Ruiz, S. and R. Madariaga

Dynamic inversion of intermediate depth earthquakes and Brune's model

15:00 – 15:20 Ampuero, J.-P.

Insights on earthquake dynamics enabled by high-frequency source imaging with dense seismic arrays

15:20 – 15:40 Dalguer L.A. and P. Galvez

A dynamic rupture model with slip reactivation for the 2011 Mw 9.0 Tohoku Earthquake

15:40 – 16:00 Huang, Y. and J.-P. Ampuero

Constrains on fault properties from integration of observations and dynamic rupture models of the Tohoku-Oki Earthquake

16:00 – 16:20 Gabriel, A.-A., J.-P. Ampuero, L.A. Dalguer and P.M. Mai

Source properties and complexity of dynamic ruptures in elastic and plastic media

16:20 – 17:00 End of oral sessions / Closing remarks & Discussion

17:00 – Departure of participants

Posters

Seismic Observations and Scaling on a Variety of Scales

1. Moyer, P., M. Boettcher, J.J. McGuire and J. Collins

   Radiated energy of 3.0 ≤ M ≤ 5.0 earthquakes in rupture patches and rupture barriers on Gofar Transform Fault, East Pacific Rise

2. Holden, C.

   Source studies of the ongoing (2010-2011) sequence of recent large earthquakes in Canterbury

3. Kaiser, A. and Oth, A.

   Spectral inversions of data from the Canterbury earthquake sequence, New Zealand, for source, path and site parameters

4. Baltay, A.S., T.C. Hanks and G.C. Beroza

   Understanding the NGA-West ground-motion prediction equations for PGA and PGV

5. Yoo, S.-H. and K. Mayeda

   Validation of source scaling using ground motions from the 2008 Wells, Nevada Earthquake sequence

6. Abercrombie, R. E.

   Is the ongoing earthquake scaling controversy simply a matter of different modeling approaches and underestimated uncertainties?

7. Michalek, J., H. Cermakova, T. Fischer and J. Horalek

   Static source parameters of the West Bohemia/Vogtland earthquake swarms

8. Ortega, R. and L. Quitanar

   Scalar moment variations and isotropic characteristics of the main- and after-shock earthquakes in transform fault system

9. Kocharyan, G.G.

   The fault stiffness as the key parameter that controls EQ efficiency scaling law

10. Uchide, T. and C. Ji

    Self-similar rupture growth and its break due to the finite seismogenic layer: Revisit of the cumulative moment rate functions of large earthquake

11. Miyake, H., K. Irikura, L. Dalguer and S. Murotani

    Three-stage magnitude-area scaling supported by slip inversions and dynamic rupture simulations

12. Vallée, M.

Seismic source properties extracted from a new global and complete catalogue of earthquake source time functions

13. Hjörleifsdottir, V., H.S. Sanchez, S.K. Singh, X. Pérez-Campos and A. Iglesias

Areas of slip of recent earthquakes in the Mexican subduction zone

14. Yabe, S., S. Ide, S. Yoshioka

Non-volcanic tremor activities and thermal structures in various subduction zones

Recent Mega-Earthquakes and their Seismic Radiation Characteristics

15. Inbal, A., J.-P. Ampuero, S. Lui, D. Helmberger and R.W. Graves

Envelope inversion for the spatio-temporal distribution of high-frequency energy radiators of the M9.0 Tohoku-Oki earthquake

16. Yuta, M., Y. Iio and Y. Fukahata

Radiation efficiency and breakdown work in a dynamic rupture model for the 2011 Tohoku earthquake considering recent stress accumulation and thermal fluid pressurization

17. Meng, L., J.-P. Ampuero, J.Stock, Z. Duputel, Y. Luo and V.C. Tsai

Compressional rupture branching in a weakened oceanic lithosphere during the 11 April 20123 M8.6 Sumatra earthquake

Source Physics: Modeling Results and Constraints

18. Heaton, Th. and A. Elbanna

The slip pulse equation for multi-scale simulation of strong-rate-weakening friction

19. Jiang, J. and N. Lapusta

Earthquake sequences on faults with heterogeneous compressive stress and enhanced co-seismic weakening

20. Van Dinther, Y., T. Gerya, L.A. Dalguer, F. Corbi, F. Funiciello and P.M. Mai

The seismic cycle at subduction thrusts: Implications of geodynamic simulations bechmarked with laboratory models

21. Van Dinther, Y., T. Gerya, P.M. Mai, L.A. Dalguer and G. Morra

The seismic cycle on spontaneously evolving subduction faults in realistic geometry geodynamic simulations

22. Zhang, Y., S.G. Song, L.A. Dalguer and J. Clinton

Inferring earthquake source properties from dynamic rupture models by means of non-linear kinematic source inversion

23. Galis, M., Ch. Pelties, J. Kristek, P. Moczo and P.M. Mai

Initiating spontaneous rupture propagation in dynamic models with linear slip-weakening friction – a parametric study

24. Hatano, T.

Scaling properties of critical slip distance within the framework of rate-and-state-dependent friction law

25. Radiguet, M., D.S. Kammer, V.A. Yastrebov and J.-F. Molinari

Dynamics of slip fronts at frictional interfaces: Analysis of slip precursors and rupture velocity

26. Ryan, K. and D.D. Oglesby

Modeling jumping rupture and rupture through stable-sliding zones using various friction laws

27. Song, S.G. and L.A. Dalguer

Propagation of 1-point and 2-point statistics from dynamic source through kinematic to ground motions

Laboratory Studies and Fault Zone Structure

28. Spagnuolo, E., S. Nielsen, G. Di Toro, M. Violay, S. Smith, F. Di Felice

Experimental investigation of frictional stick-slip, stable sliding and runaway under earthquake deformation conditions

29. Pluymakers, A., J. Samuelson and C. Spiers

Frictional behavior of simulated anhydrite fault gouge and the effects of supercritical CO_2

30. Yamaguchi, T.

Gutenberg-Richter law, giant earthquakes and slow events in laboratory experiment

31. Wust-Bloch, G.H. and M. Tsesarsky

Full waveform analysis and micromechanics of source processes at nanoseismic scale

32. Townend, J., R. Sutherland, V.G. Voy, S.C. Cox and C.J. Boulton

Fault zone structure of the central Alpine Fault revealed during the first phase of the Deep Fault Drilling Project (DFDP-1)

33. Toy, V.G., C.J. Bouton, N.C. Barth, B. Carpenter, IODP Expedition 343 Scientists and IODP-MI, D. Goldsby, A. Kopf, T. Mitchel, C. Marone, R. Sutherland, J. Townend and T. Tullis

What can microstructural observations of natural faults tell us about dissipative mechanisms that operated at the earthquake source?

Induced Seismicity: Seismic Observations and Source Characterization

34. Kane, D. and M. Boettcher

Observations of isotropic moment tensor components and scaling with seismic moment in TauTona Mine, South Africa

35. Milev, A., R. Durrheim, M. Nakatani, Y. Yabe, H. Ogasawara, M. Naoi and SATREPS

Quasi-static and dynamic deformations of the rocks associated with mining induced seismic events around deep level mining in South Africa

36. Naoi, M., M. Nakatan i, J. Philipp, S. Horiuchi, K. Otsuki, T. Kgarume, G. Morema, S. Khambule, T. Masakale, K. Miyakawa, A. Watanabe, H. Moriya, O. Murakami, Y. Yabe, H. Kawakatai, N. Yoshimitsu, T. Ward and H. Ogasawara

Magnitude-frequency distributions of AEs associated with the mining front and pre-existing faults-cases from SATREPS array operating in a South African gold mine

37. Adamovà, P., J. Šílený and E. Löffler

Second Degree Moments - A tool for the fault plane detection?

38. Jechumtálová, Z. and J. Šílený

Samples of micro-earthquake mechanisms induced by fluid injection at the Hot Dry Rock site Soultz (Alsace) in 2003 using alternative source models

39. Martinez, P., M. Bohnhoff and G. Kwiatek

Relation between stress field changes and fluid injection at The Geysers Geothermal Field, California

40. Šílený, J.

Shear-tensile model - A prospective alternative to moment tensor in seismic detection of fracture mode during hydrofracture treatment of oil and gas well

Open Session

41. Acarel, D., Bulut F. and Bohnhoff M.

Characterization of seismic velocity structure in the eastern Sea of Marmara region, NW Turkey, using ambient noise

42. Can, B., M. Aktar, F. Bulut, M. Bohnhoff and G. Dresen

High accuracy study of source scaling in Marmara Sea using seismic arrays

43. Ickrath, M. and M. Bohnhoff

Spatiotemporal variations of the crustal stress field during the seismic cycle: Applications to the Marmara region, NW Turkey

44. Stierle, E., V. Vavrycuk, J. Šílený and M. Bohnhoff

Resolution of non-double-couple components in the seismic moment tensor using local networks: Synthetic case study and application to aftershocks of the 1999 Mw 7.4 Izmit Earthquake

45. Bulut, F., Bohnhoff M., Kilic T., Kartal R.F., Kadirioglu T and Dresen G.

Long-lasting aftershock activity of the 2011 Kutahya/Turkey earthquake (Mw 5.8): Lessons learned from precise earthquake locations

46. Cermakova, H., Ruzek B. and Fischer T.

Comparison of the West Bohemia earthquake swarms in 2008 and 2011 from the point of view of the focal migration and source-mechanism variation

47. Vavrycuk, V. and F. Bouchaala

High-resolution fault tomography from accurate locations and focal mechanisms of swarm earthquakes

48. Kishkina, S.B.

Seismic observations of micro-earthquakes at small scale fractures