Presentation for February 6, 2012
USC, Los Angeles, CA

February 2012 SCEC Rupture Dynamics Code Validation Workshop

Ruth A. Harris
(U.S. Geological Survey)

Plans for this workshop

*See a quick overview of our group's activities to date

*Learn about a new heterogeneous stress formulation

*Learn about 2 new codes

*Examine the results from the latest benchmarks

*Learn about fault stepovers

*Learn about a new science collaboration platform

*Plan our next steps

SCEC Rupture Dynamics Code Validation Workshop

Monday February 6, 2012
Davidson Conference Center, USC, Los Angeles, CA

09:30	Introduction to the Workshop	*Ruth Harris*
09:50	A New Method for Heterogeneous Initial Stress	*Michael Barall*
10:30	A New Code, DGCrack	*Josue Tago/ Victor Cruz-Atienza*
10:55	A New Code, SeisSol (ADER-DG)	*Christian Pelties*
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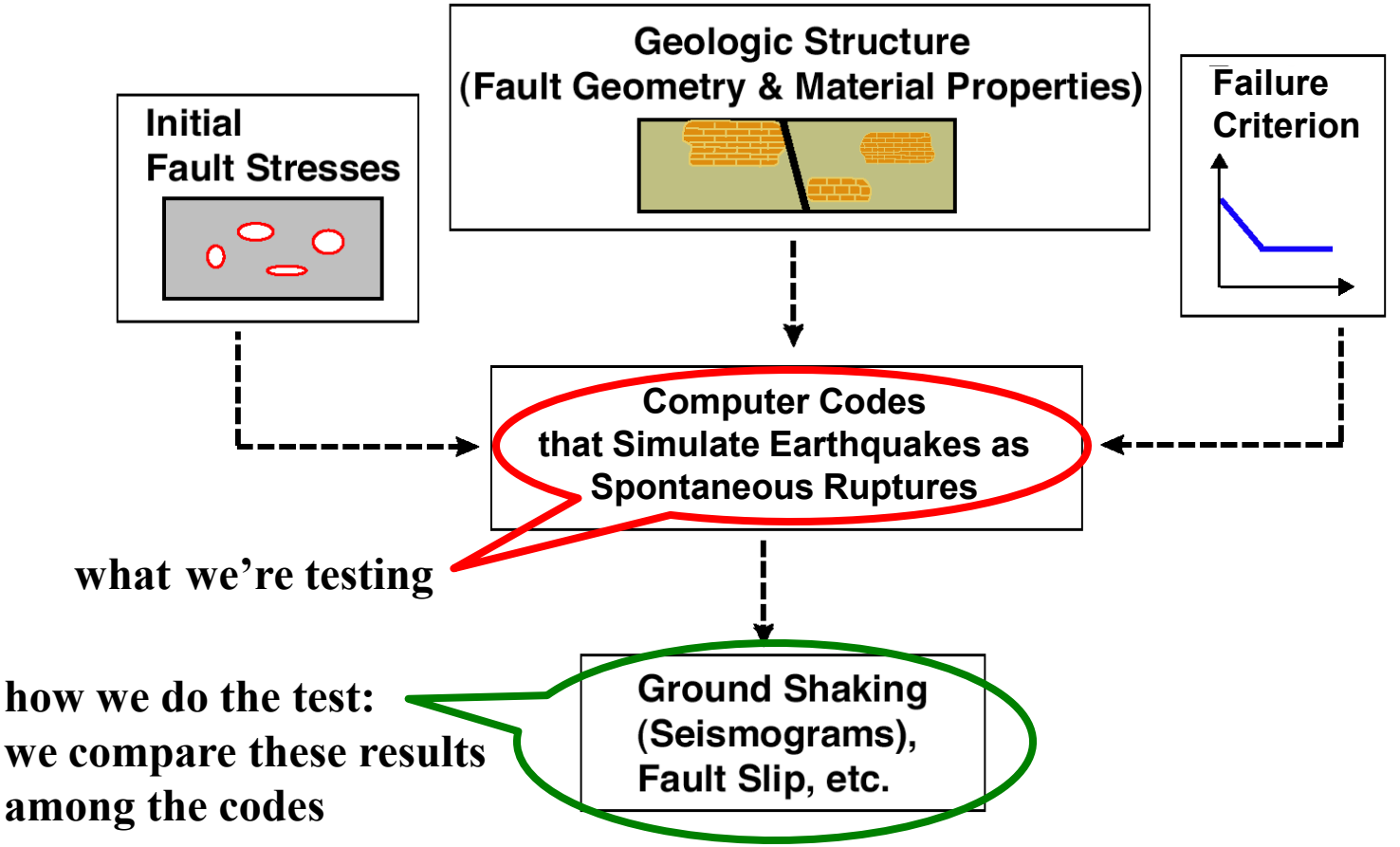
15:00	*Break*	
15:20	From Dynamic Rupture to Ground Motion	*Norm Abrahamson*
15:45	A New Science Collaboration Platform, SCEChub	*Tran Huynh*
16:10	Additional Discussion	*Ruth Harris/ All*
17:00	Adjourn	

What our Group Does – Computer Code Testing



Please see our website http://scecdata.usc.edu/cvws

Overall Goal of our Code Verification Group

Compare the computational methods
currently being used by SCEC and USGS scientists to
simulate (spontaneous) earthquake rupture dynamics

Some Specific Objectives

Understand if our methods are producing the same results when using
the same assumptions about friction, crustal structure, fault geometry, etc.

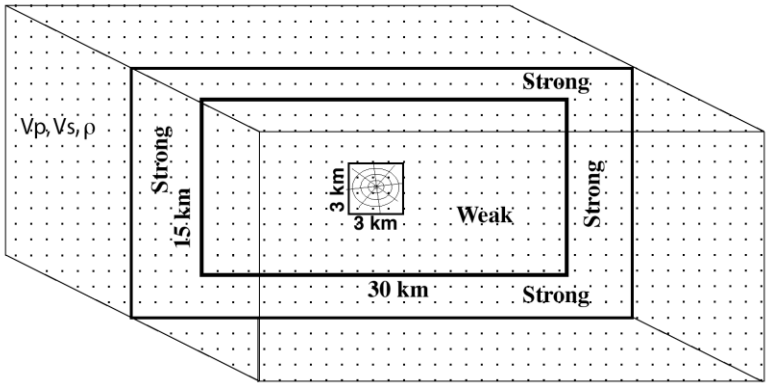
Funding

This project has been funded by the Southern California Earthquake Center,
the U.S. Geological Survey, the U.S. Dept. of Energy, and the PG&E Company

Code Comparison Strategy

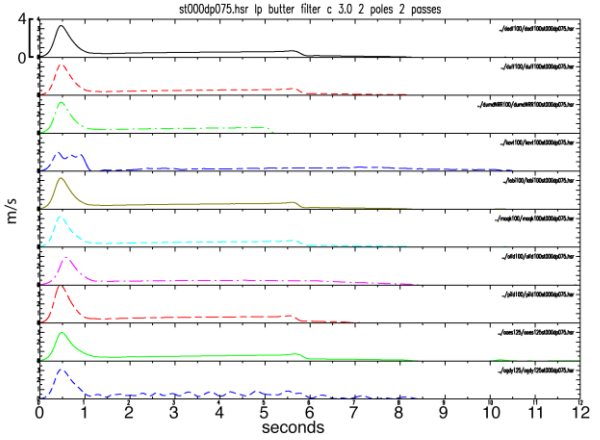
Start simply

Spontaneous rupture on a **vertical strike-slip fault set in a homogeneous (materials) elastic Fullspace**

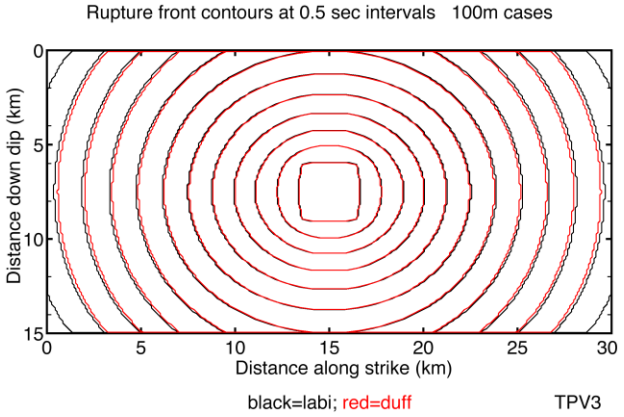


homogeneous initial stresses

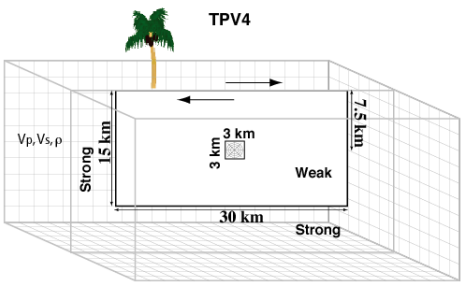
slip-weakening friction

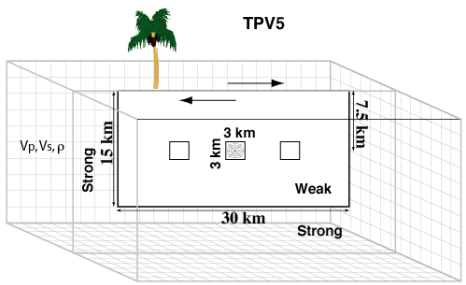


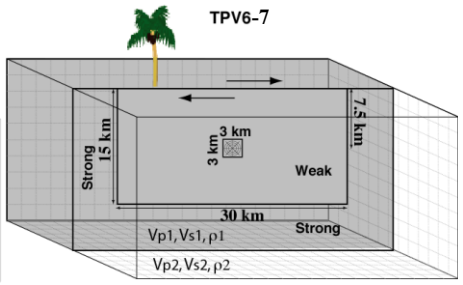
Some Results

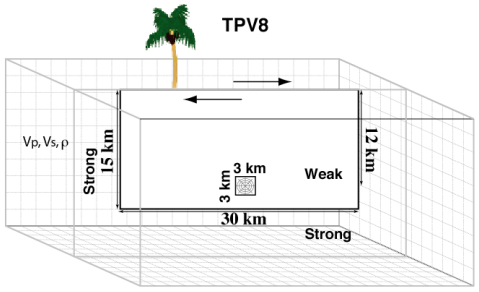


Code Comparison Benchmarks – Incrementally add complexity

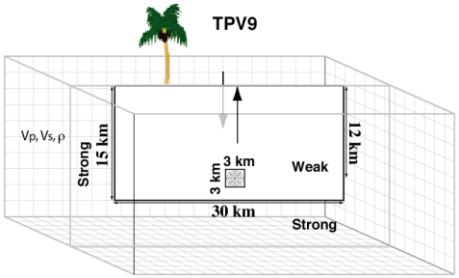


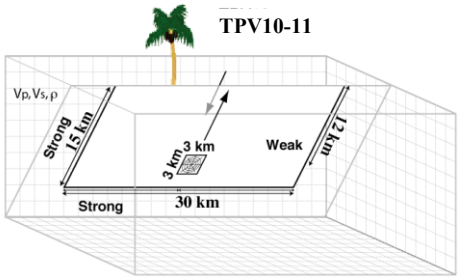


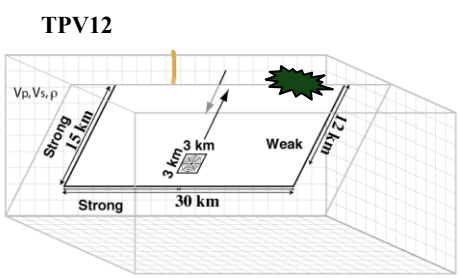


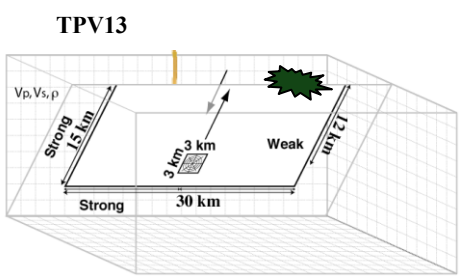


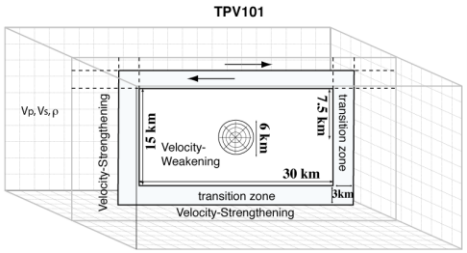
Slip-weakening friction

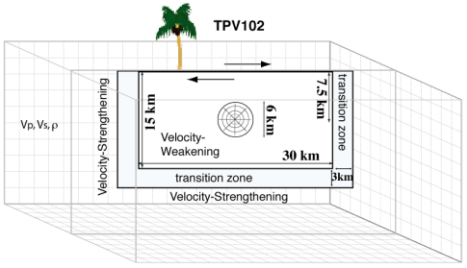


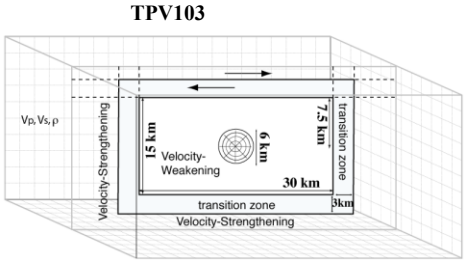


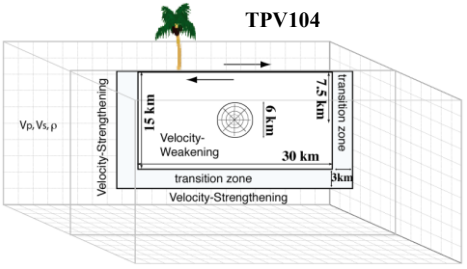












Rate-state friction using an ageing law

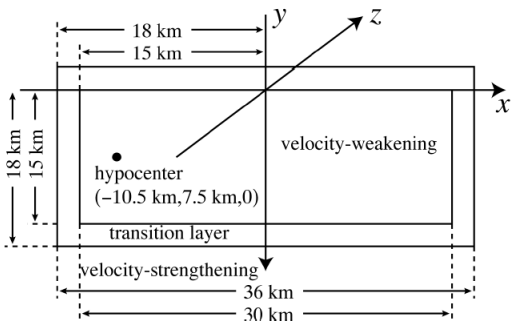
Rate-state friction using a slip law with strong rate-weakening

Harris Feb. 2012

Code Comparison Strategy

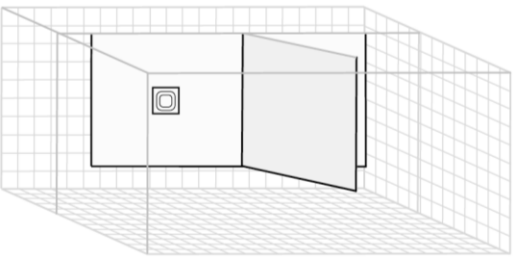
Incrementally adding complexity: friction, fault geometry

TPV105-2D



Rupture on a vertical strike-slip fault set in a homogeneous material elastic halfspace, **Thermal pressurization** with rate-state friction, slip-law, strong rate-weakening

TPV14, 15

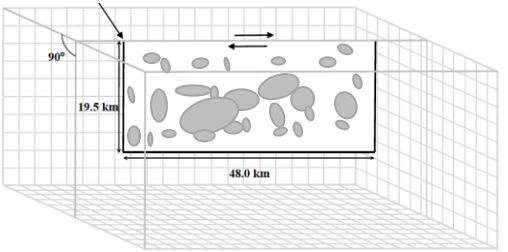


Rupture on a **Branching** strike-slip fault set in a Homogeneous (material) elastic halfspace, homogeneous initial stresses, Slip-weakening friction

Code Comparison Strategy

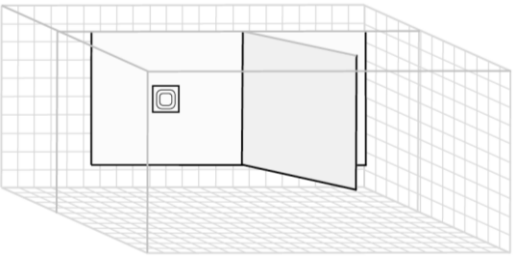
Incrementally adding complexity: stress, fault geometry

→ Rupture on a vertical strike-slip fault set in a homogeneous material elastic halfspace, **Heterogeneous initial Stresses,** Slip-weakening friction



TPV16, 17

→ Rupture on a **Branching** strike-slip fault set in homogeneous (material) **Plastic yielding**, Slip-weakening friction



TPV18, 19, 20, 21
elastic, plastic, elastic, plastic

Our 2011 SRL article

Harris, R.A., M. Barall, D.J. Andrews, B. Duan, S. Ma, E.M. Dunham,
A.-A. Gabriel, Y. Kaneko, Y. Kase, B.T. Aagaard, D.D. Oglesby,
J.-P. Ampuero, T.C. Hanks, N. Abrahamson,
Verifying a Computational Method for Predicting Extreme Ground Motion,
Seismological Research Letters, vol. 82, 638-644, 2011.

Our 2009 SRL article

Harris, R.A., M. Barall, R. Archuleta, B. Aagaard, J.-P. Ampuero,
H. Bhat, V. Cruz-Atienza, L. Dalguer, P. Dawson, S. Day,
B. Duan, E. Dunham, G. Ely, Y. Kaneko, Y. Kase, N. Lapusta, Y. Liu,
S. Ma, D. Oglesby, K. Olsen, A. Pitarka, S. Song, and E. Templeton,
The SCEC/USGS Dynamic Earthquake-Rupture Code Verification Exercise,
Seismological Research Letters, vol. 80, no. 1, 2009.

links available on our website

http://scecdata.usc.edu/cvws

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