Presentation for March 14, 2014
USGS, Menlo Park, CA

March 2014
SCEC Rupture Dynamics Code Comparison Workshop

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

Welcome to everyone both in the room and online!

Thank you to Ralph, our workshop Co-PI!

A big note of appreciation to Tran for making our workshops happen seamlessly!

Thank you very much to Michael for all of his dedicated hard work!

2014 Gold Star Modelers

MICHAEL BARALL, ZHEQIANG SHI, BIN LUO, BEN DUAN,
SHUO MA, XIAOFEI CHEN, ZHENGUO ZHANG,
DANIEL ROTEN, YOSHI KANEKO

Harris March 2014

Plans for this workshop

*See a quick overview of our group's activities

*Introduce new group members

*Examine and discuss a new method for producing comparison metrics

*Meet two new codes

*Examine results from the latest benchmarks, TPV26, 27, 28

*Learn about ramifications of our science for engineering implementation

*See the effects of fault geometry, velocity structure, and attenuation

*Discuss our next steps

SCEC Rupture Dynamics Code Comparison Workshop

Friday March 14, 2014
U.S. Geological Survey, Menlo Park, CA

10:00	Introduction to the Workshop	*Ruth Harris*
10:20	Metrics, Version 1	*Michael Barall/ All*
11:20	A New Participating Code	*Xiaofei Chen*
11:50	A New Participating Code	*Kenneth Duru*
12:20	*Lunch*	
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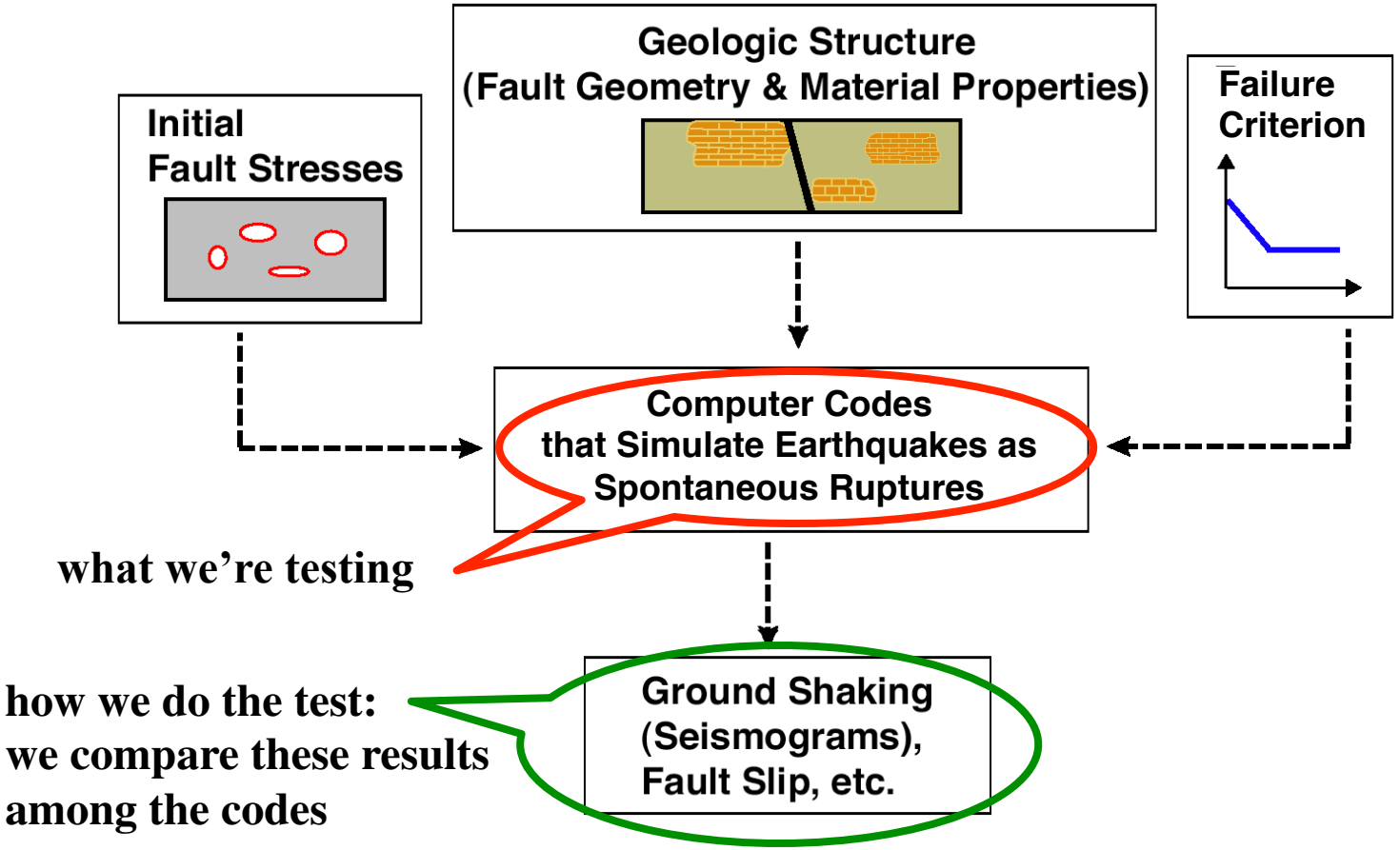
16:45	Additional Group Discussion	*Ruth Harris/ All*
17:30	Adjourn	

What our Group Does: We Test Computer Codes Used to Simulate Earthquakes



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.

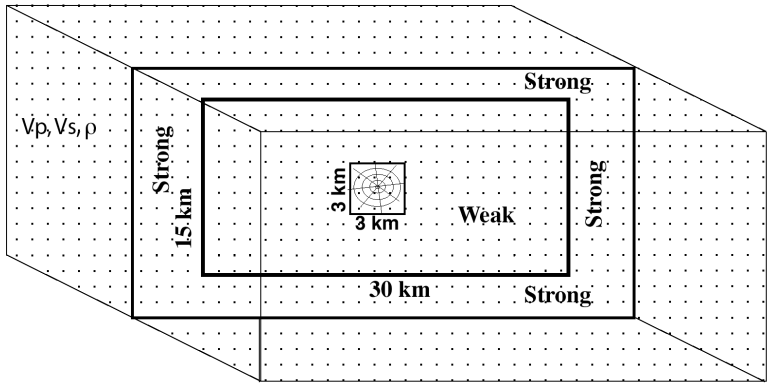
Funding

This project receives funding from SCEC, the USGS, and PG&E

Code Comparison Strategy

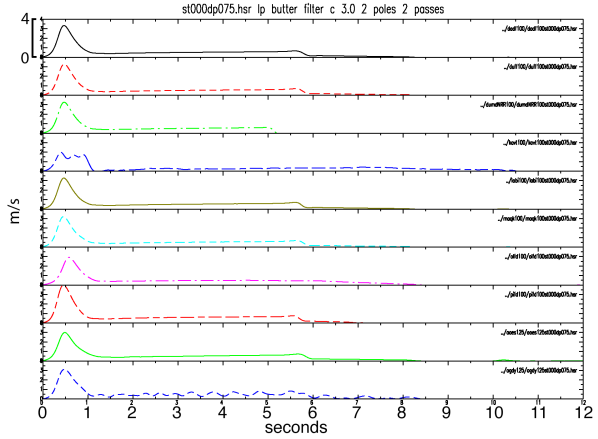
Start simply

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

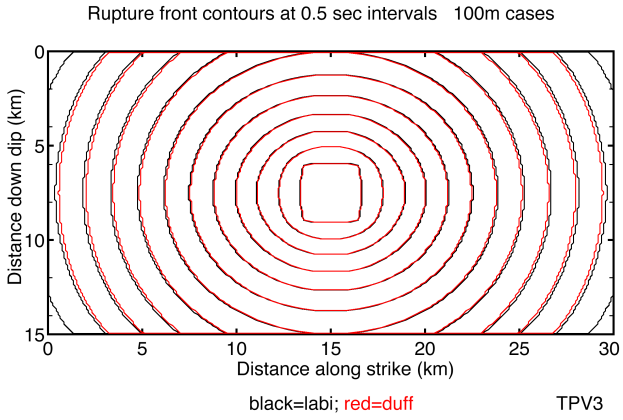


homogeneous initial stresses

slip-weakening friction

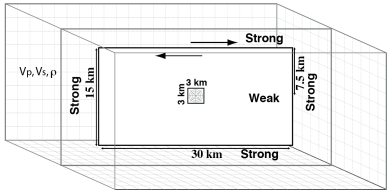


Some Results

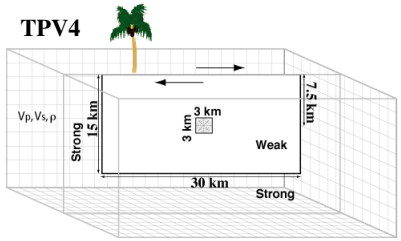


Code Comparison Benchmarks – Incrementally add complexity

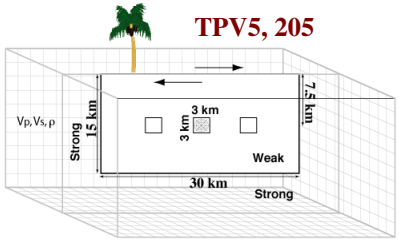
TPV3



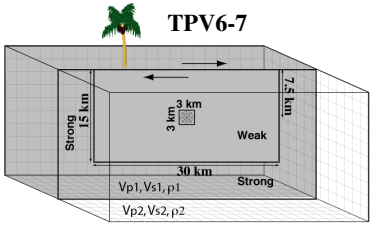
TPV4



TPV5, 205

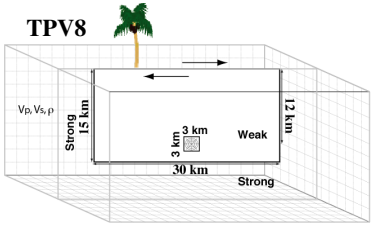


TPV6-7

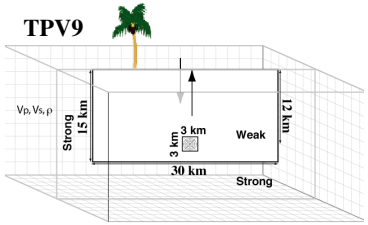


Slip-weakening friction

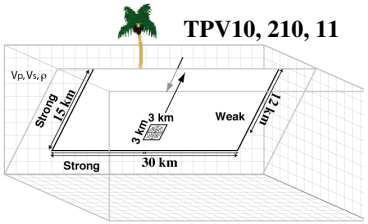
TPV8



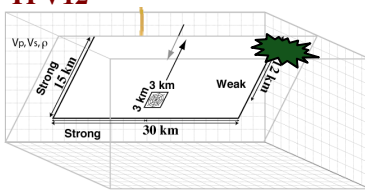
TPV9



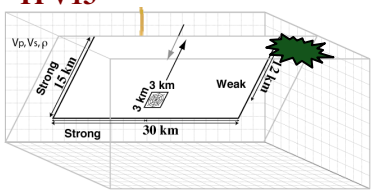
TPV10, 210, 11



TPV12

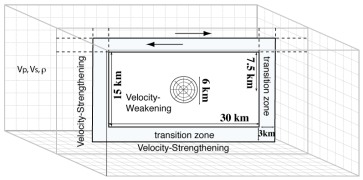


TPV13

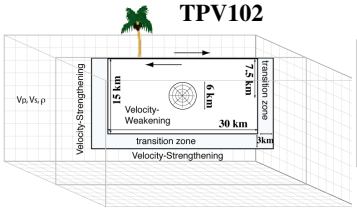


Slip-weakening friction

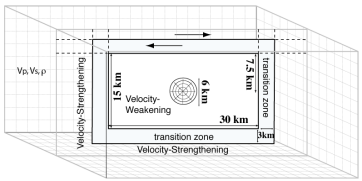
TPV101



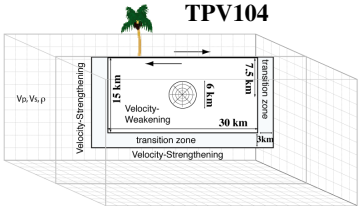
TPV102



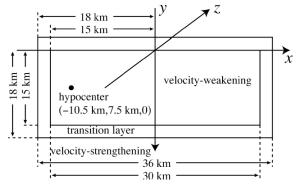
TPV103



TPV104



TPV105-2D

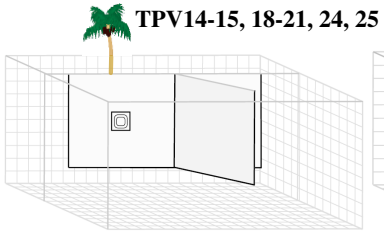


Rate-state friction using an ageing law

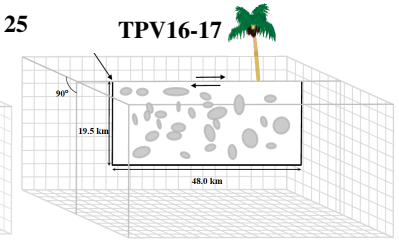
Rate-state friction using a slip law with strong rate-weakening

Thermal pressurization, rate-state friction, slip-law, strong rate-weakening

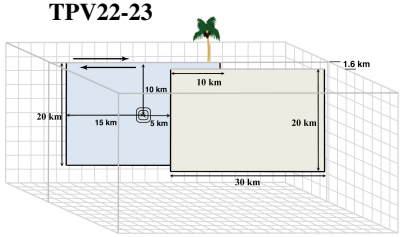
TPV14-15, 18-21, 24, 25



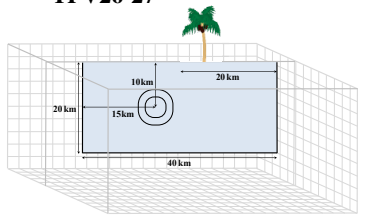
TPV16-17



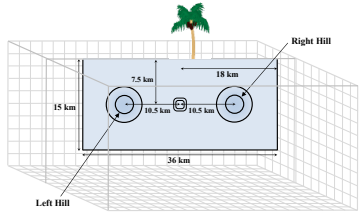
TPV22-23



TPV26-27



TPV28



Slip-weakening friction

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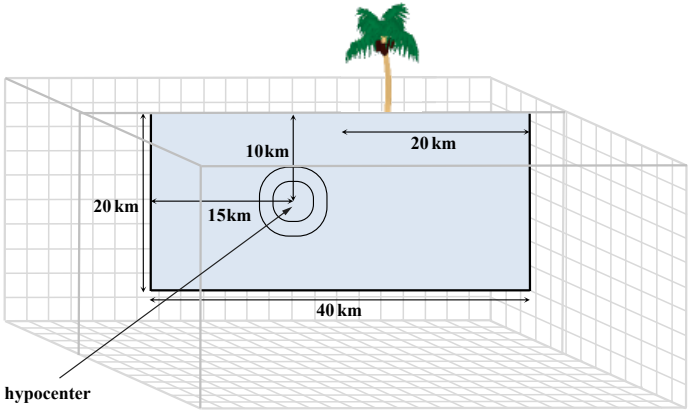
Code Comparison Strategy

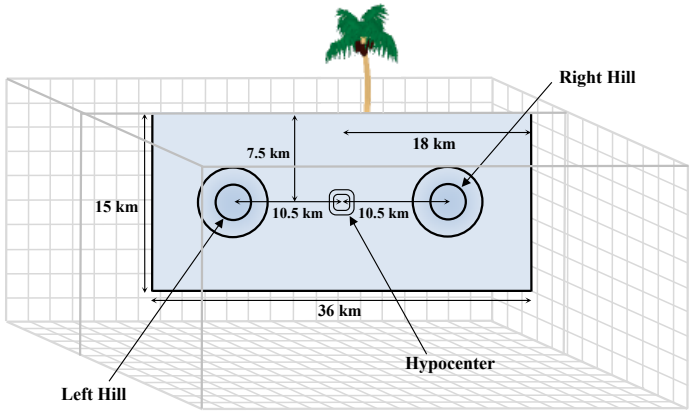
Incrementally adding complexity: viscoplasticity, fault roughness

Rupture on a vertical planar strike-slip fault set in a homogeneous material, **elastic/viscoplastic** halfspace, Slip-weakening friction



TPV26, 27
elastic, viscoplastic

Rupture on a **slightly-rough** vertical strike-slip fault set in a homogeneous material elastic halfspace, Slip-weakening friction



TPV28

2014 BENCHMARKS

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, 119-126, 2009.

links available on our website

http://scecdata.usc.edu/cvws

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Next Benchmark Plans (SCEC2014 Proposal)

*1D Velocity Structure

*Rougher Fault

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