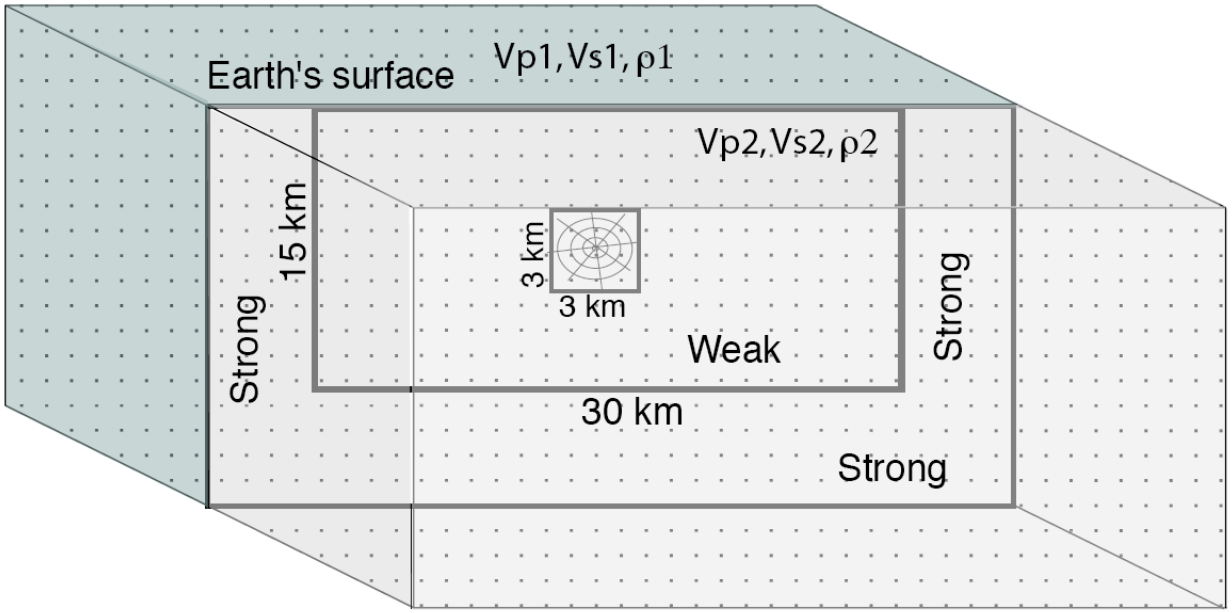
The Benchmarks:
The Problem, Versions 6 and 7

Comparisons

Feb. 12, 2007 SCEC Workshop

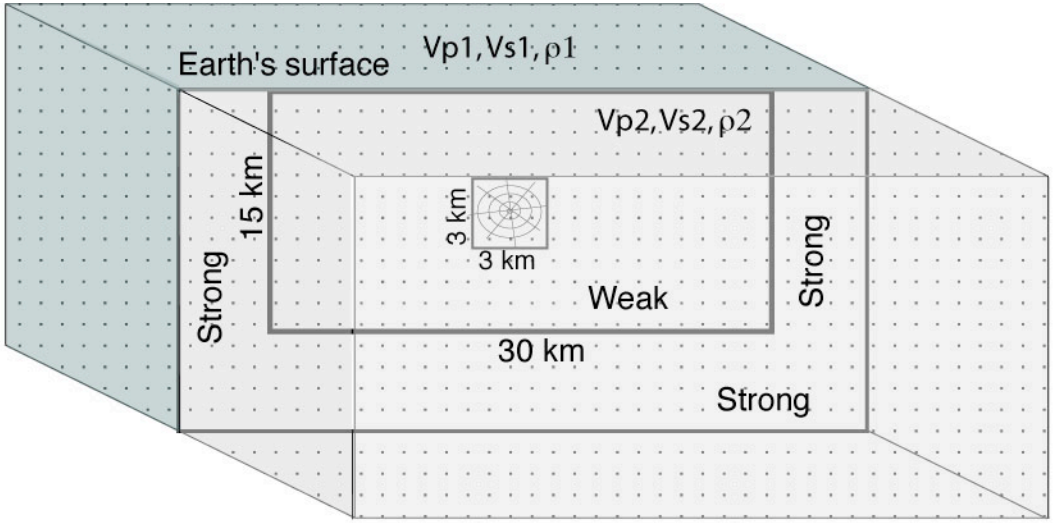
The Problem, Versions 6 and 7 (January-February 2007)

Dynamic Rupture in a Bi-Material World



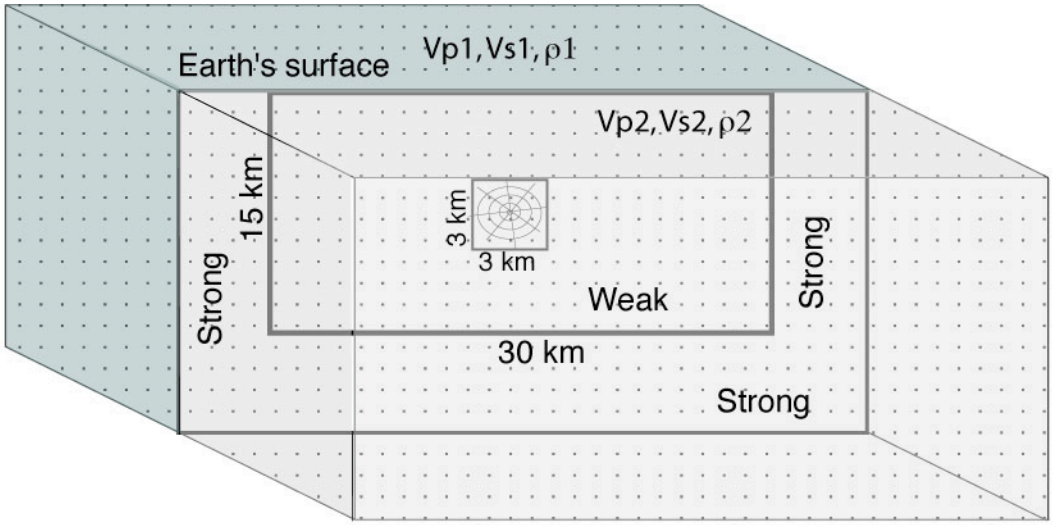
Vertical strike-slip fault is the boundary between two materials.
On the far side of the fault, Vp, Vs, density = Vp1, Vs1, ρ1
On the near side of the fault, Vp, Vs, density = Vp2, Vs2, ρ2

The Problem, Version 6



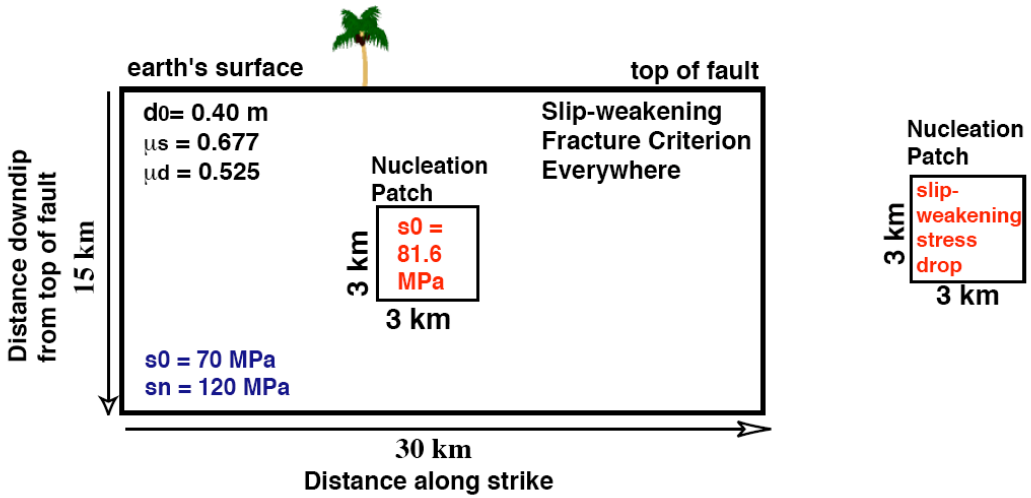
Vp2, Vs2, ρ2 = 6000 m/s, 3464 m/s, 2670 kg/m3
Vp1, Vs1, ρ1 = Vp2 / 1.6, Vs2 / 1.6, ρ2 / 1.2
= 3750 m/s, 2165 m/s, 2225 kg/m3

The Problem, Version 7



Vp2, Vs2, ρ2 = 6000 m/s, 3464 m/s, 2670 kg/m3
Vp1, Vs1, ρ1 = Vp2 / 1.2, Vs2 / 1.2, ρ2 / 1.0
= 5000 m/s, 2887 m/s, 2670 kg/m3

Rupture Dynamics Code Validation
Source Physics for The Problem, Versions 6 and 7

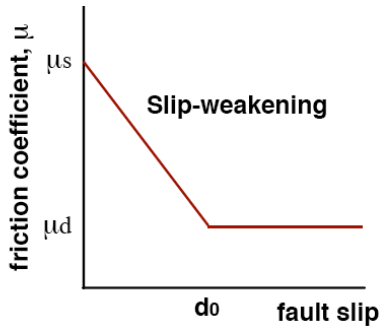


In the 3 km x 3 km Nucleation Patch, at t=0:
The initial shear stress, 81.6 MPa > the initial static yield strength, 81.24 MPa

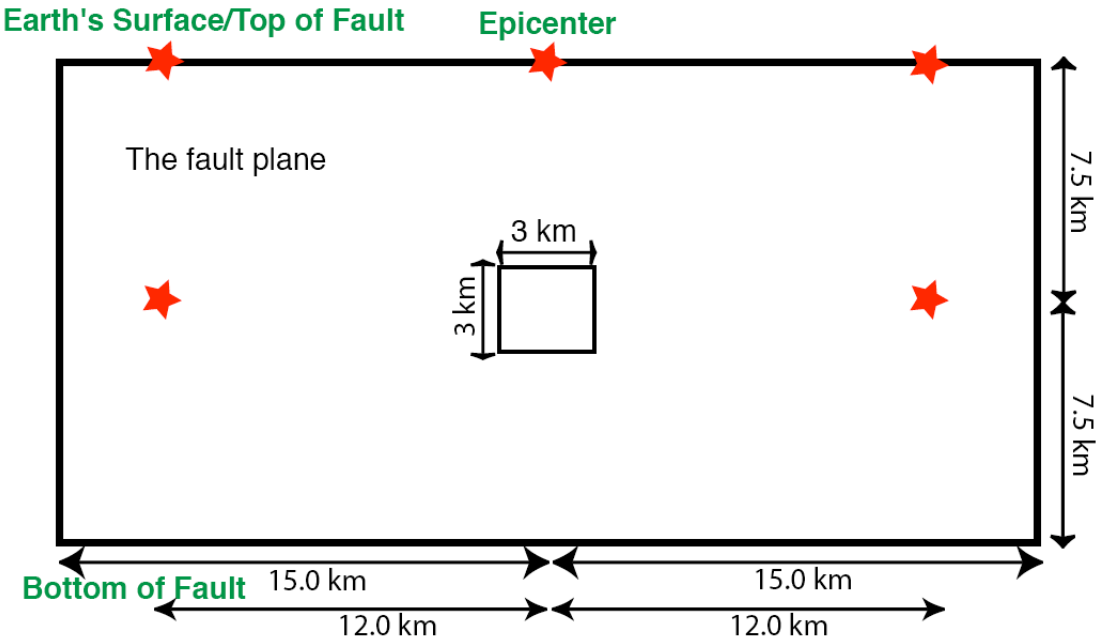
Outside the Nucleation Patch, but on the fault, at t=0:
The initial shear stress, 70.0 MPa < the initial static yield strength, 81.24 MPa

Right after Nucleation (t>0):
All stresses become time-dependent, all propagation is spontaneous,
and friction follows a linear slip-weakening fracture criterion, so that
Failure occurs when & where shearstress (t) >= (μ(faultslip)) x (normalstress(t)).

Outside of the 30km x 15 km fault area, for all t:
The rupture stops at the 30km x 15 km boundaries of the fault plane
because the static coefficient of friction is very high (strong material)



Rupture Dynamics Code Validation
Station Locations for **T**he **P**roblem, **V**ersions **6** and **7**



Stations are located at each side of the split nodes
so that there are 10 stations total

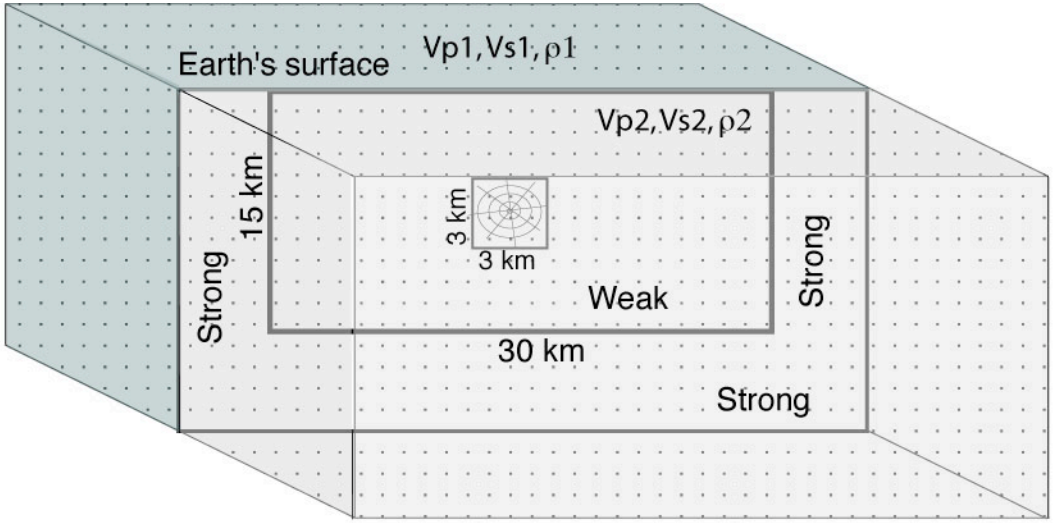
Rupture Modelers and Codes

The Problem, Versions 6 and 7

(Results Submitted by February 8, 2007)

3D Code	Code User(s)	TPV6 Spacing (m)	TPV7 Spacing (m)	Code Description
EqSim	Aagaard	100	100	Aagaard Finite Element
AWM-Olsen	Cruz Atienza/Olsen	100	100	Olsen Finite Difference
dfm	Dalguer/Day	100	100	Day Finite Difference
dfm	Day/Dalguer	50	50	Day Finite Difference
EQdyna	Duan	100	100	Duan Finite Element
MDSBI	Dunham	100	100	Dunham Spectral Bounday Integral
SGFD	Dunham2	100	100	Dunham Finite Difference
SORD	Ely	100	100	Ely Irregular-grid Support-Operator
Kase	Kase	100	100	Kase Finite Difference
BI	Liu/Lapusta	100	100	Lapusta/Liu Spectral Bounday Integral
MAFE	Ma	100	100	Ma Finite Element
DYNA3D	Oglesby	150	150	Oglesby Finite Element
FDMSPLIT	Pitarka	100	100	Pitarka Finite Difference
ABAQUS	Templeton/Bhat	100	100	ABAQUS Finite Element/Explicit

The Problem, Version 6
Comparisons



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Rupture Front Times

Look at contour plots

on

http://scecdata.usc.edu/cvws

Problem: tpv6 (The Problem, Version 6)

File: cplot (rupture contour plot)

Back to File List Logout

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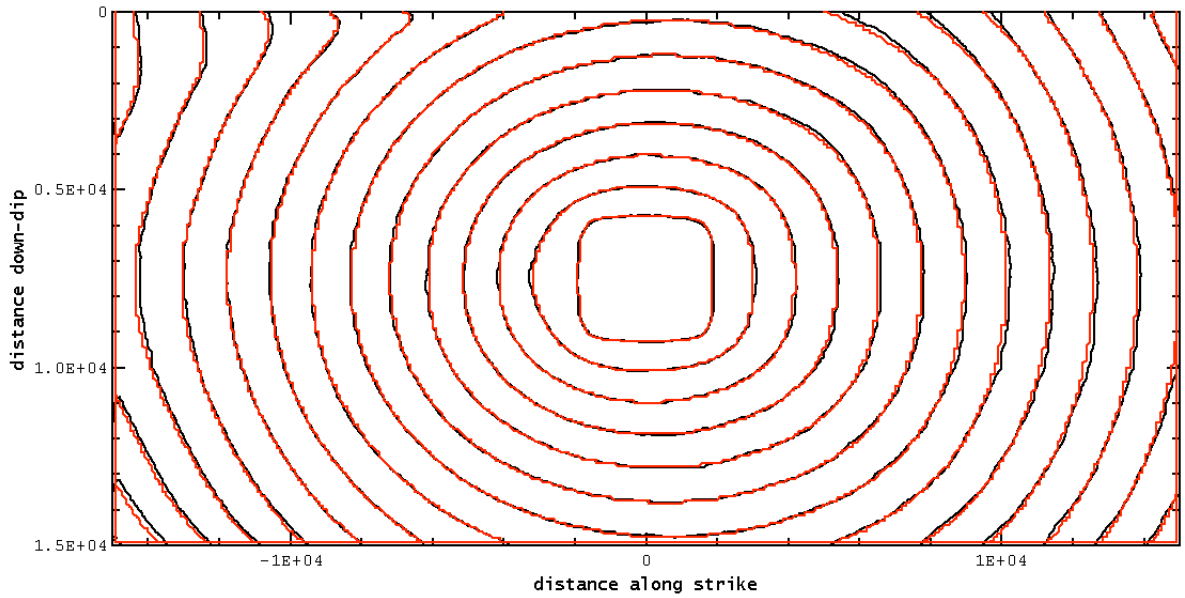

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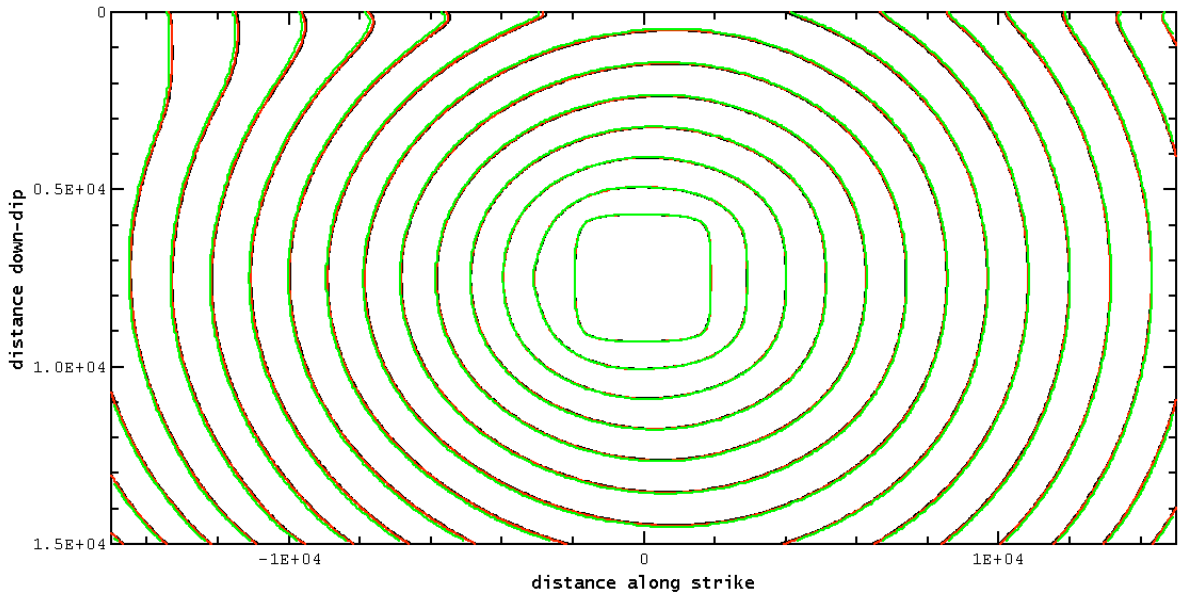

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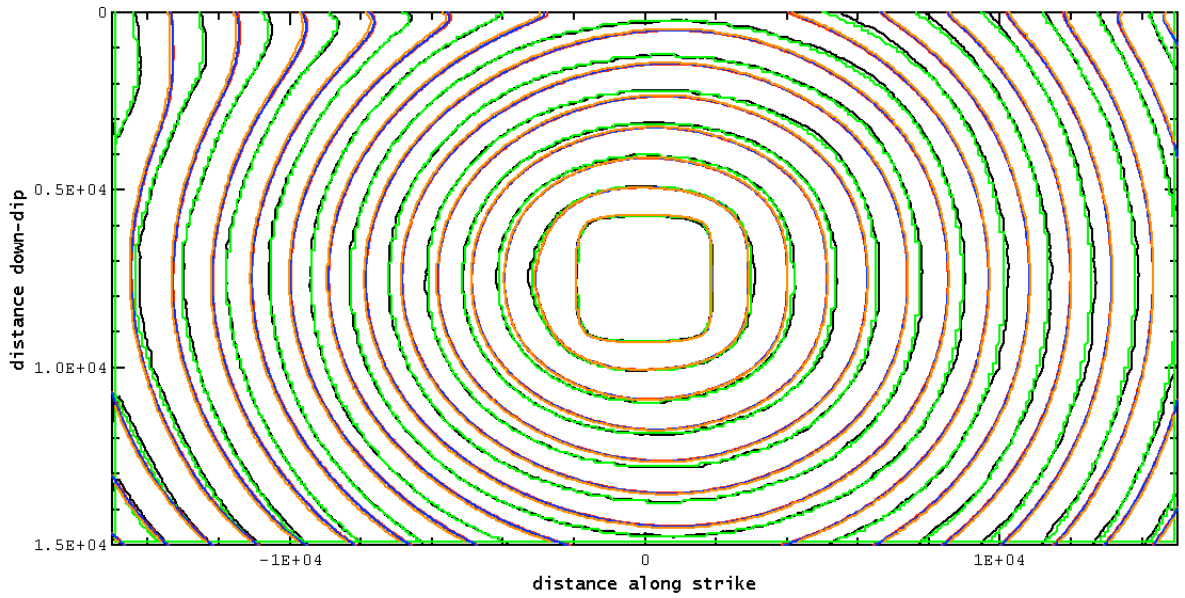

Synthetic Seismograms

Feb. 12, 2007 SCEC Workshop

Look at time-series

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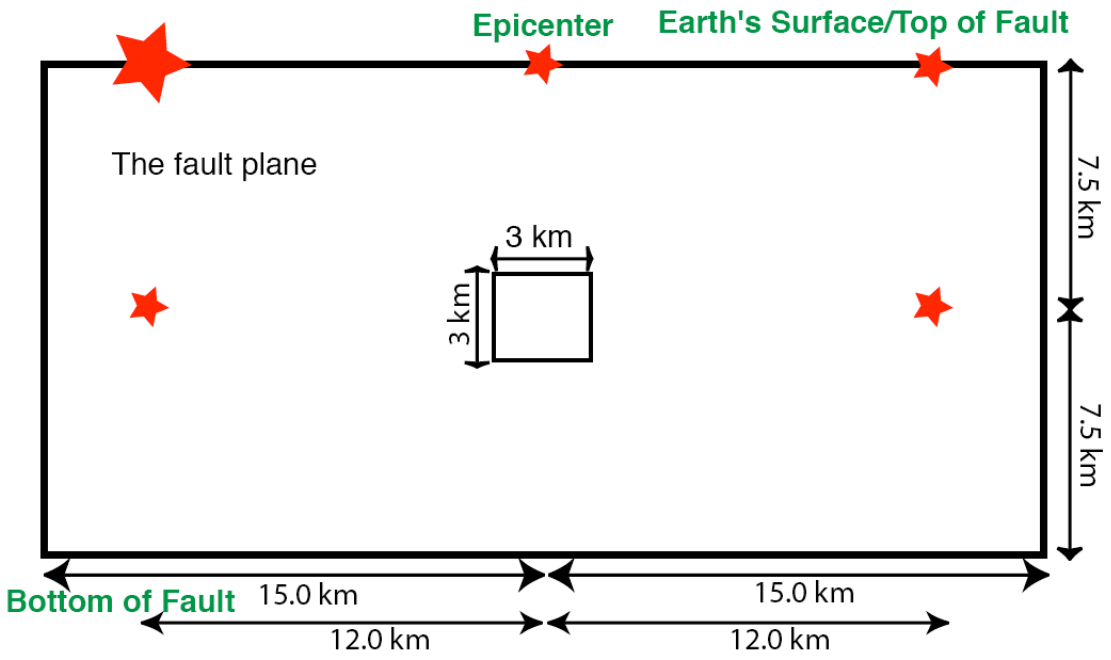
apply filter to time-series



Stations are located at each side of the split node

Problem: tpv6 (The Problem, Version 6)

File: nearst-120dp000 (near side, strike -12.0 km, depth 0.0 km)

Field: h-vel (horizontal velocity)

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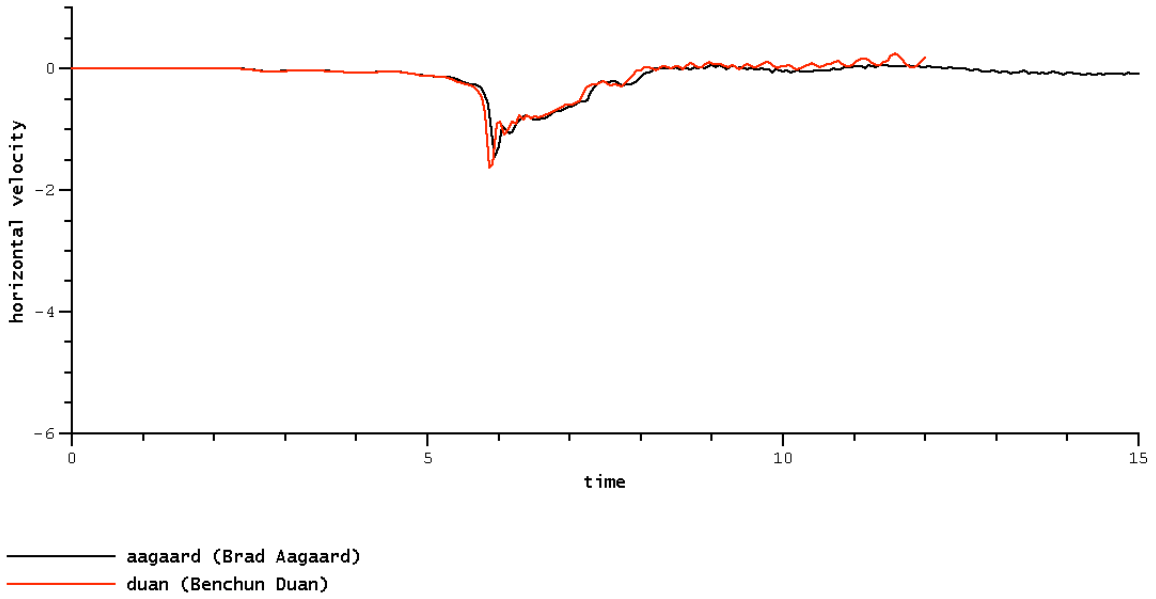

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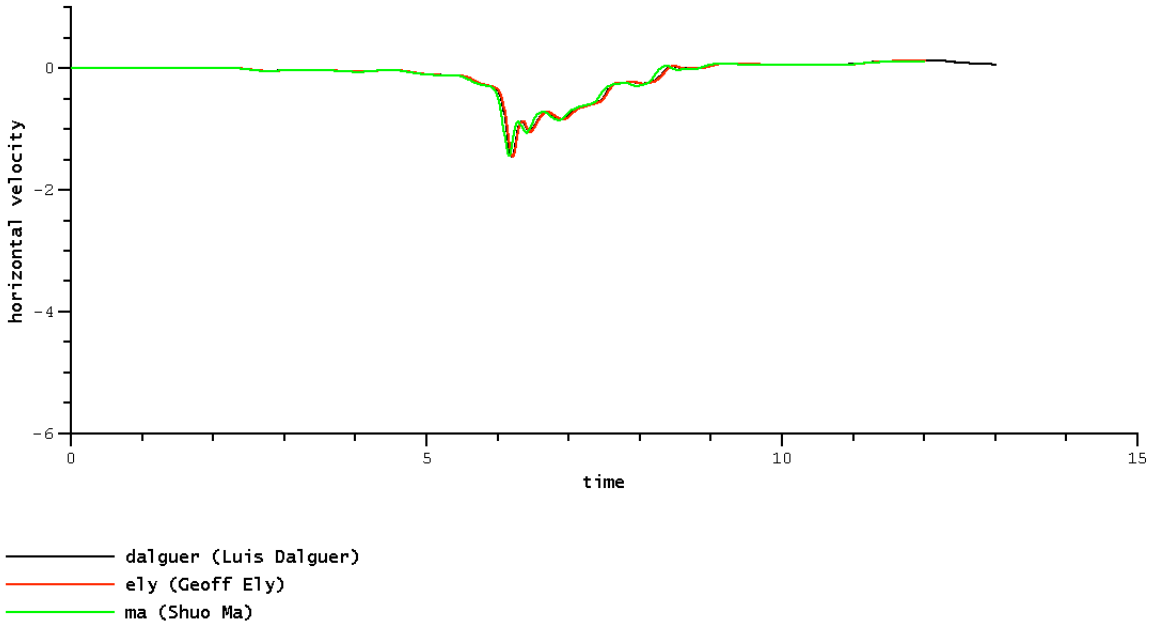

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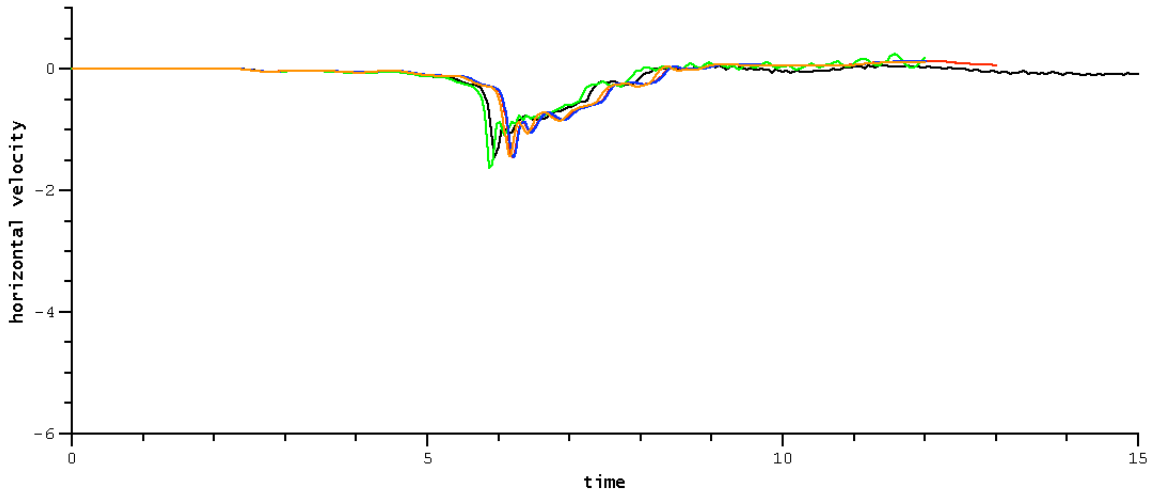

aagaard (Brad Aagaard)
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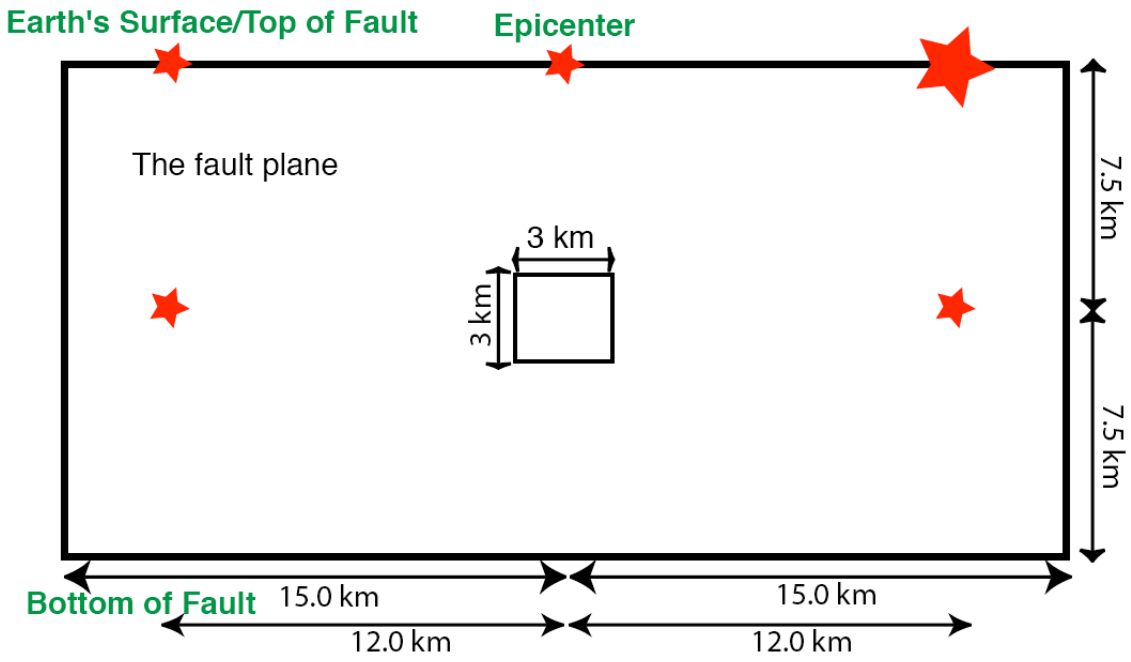
duan (Benchun Duan)
ely (Geoff Ely)
ma (Shuo Ma)



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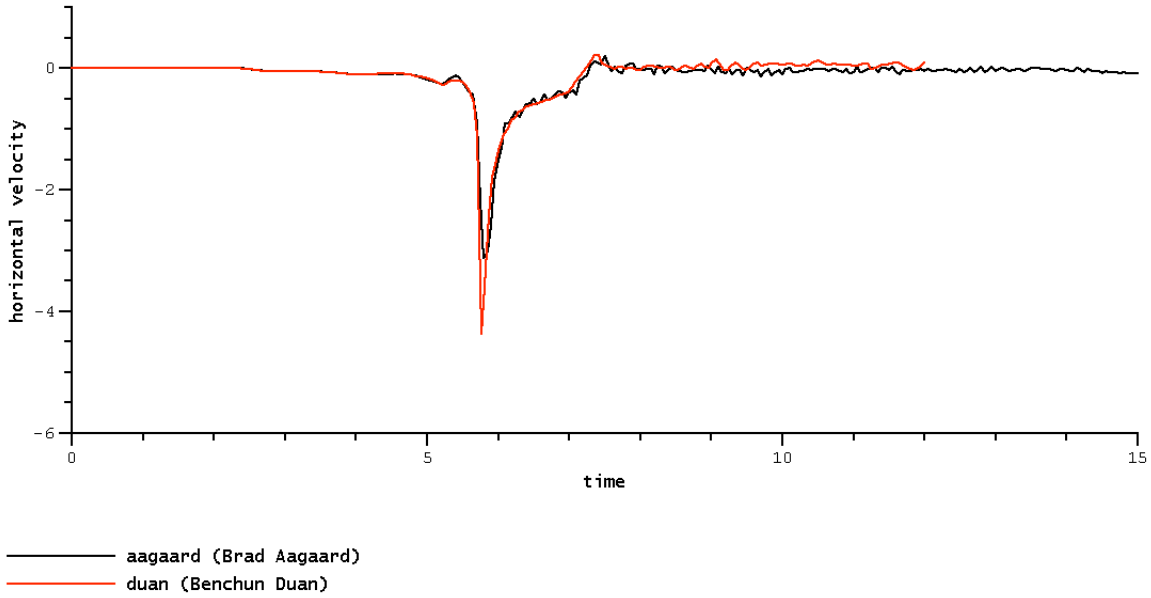

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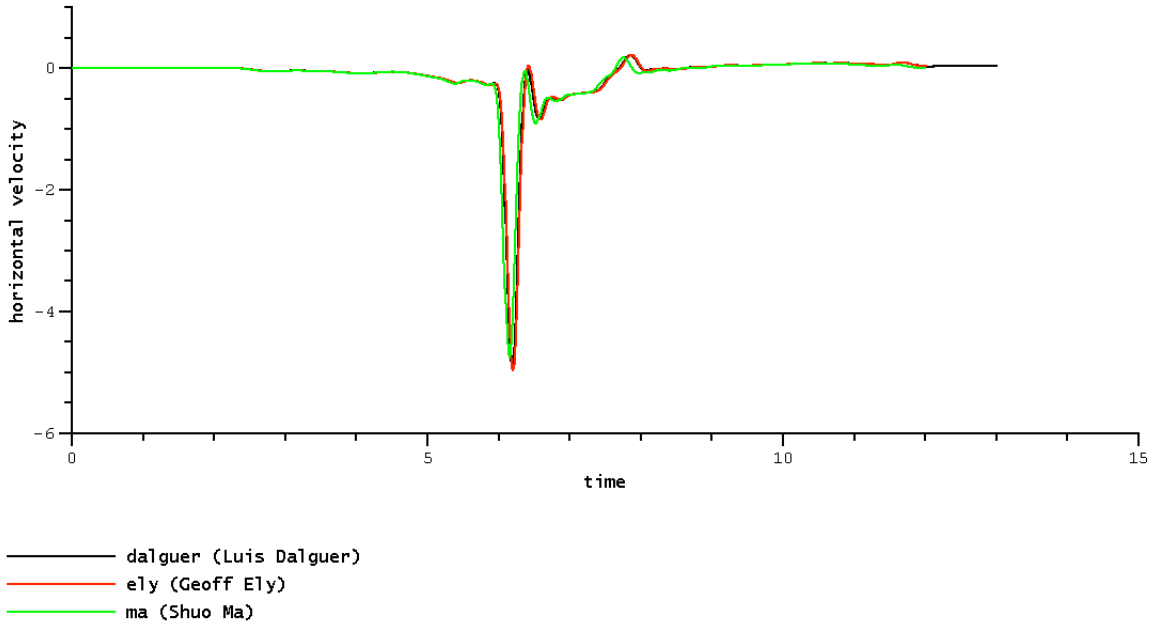

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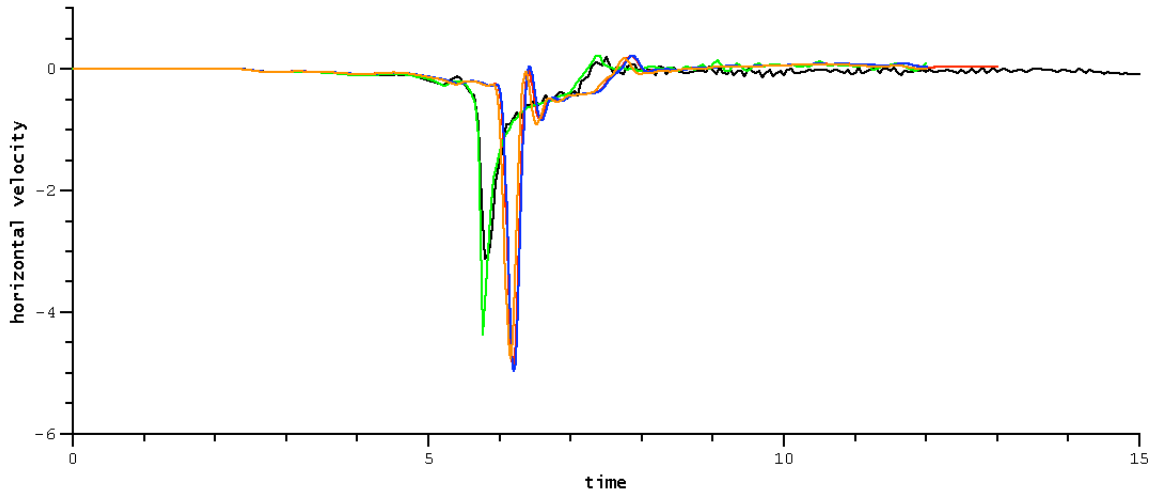

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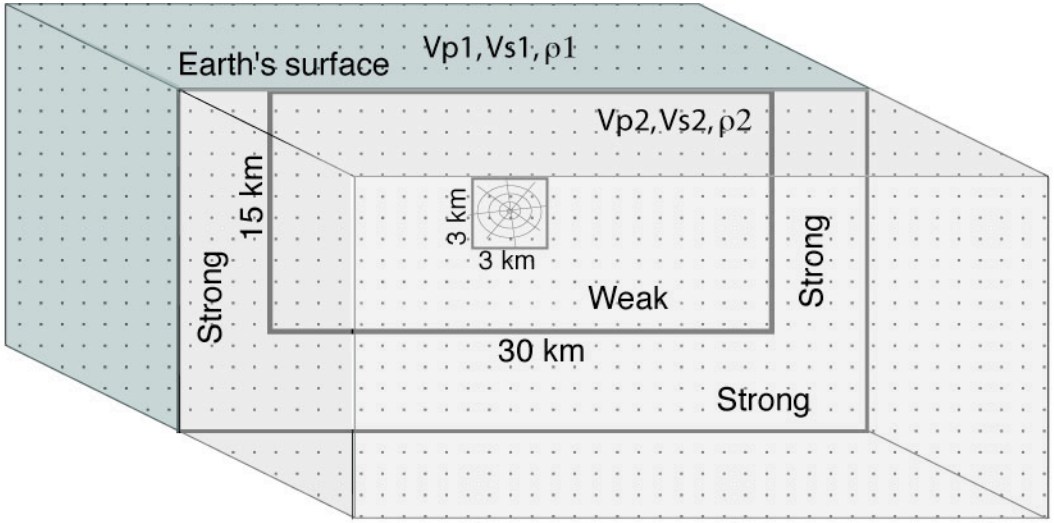

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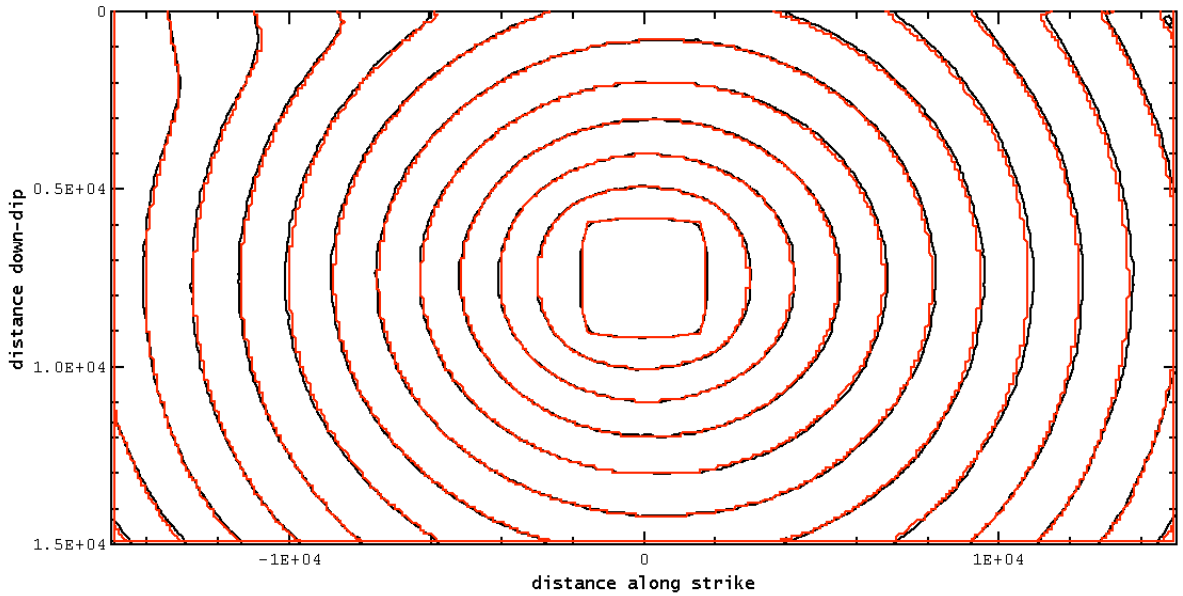

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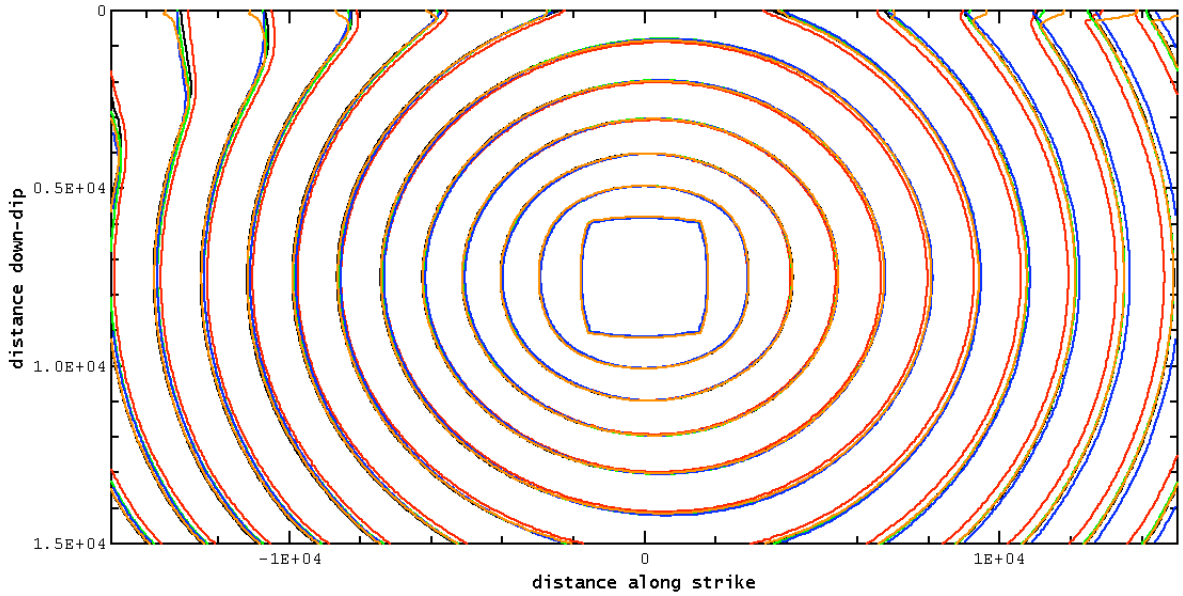

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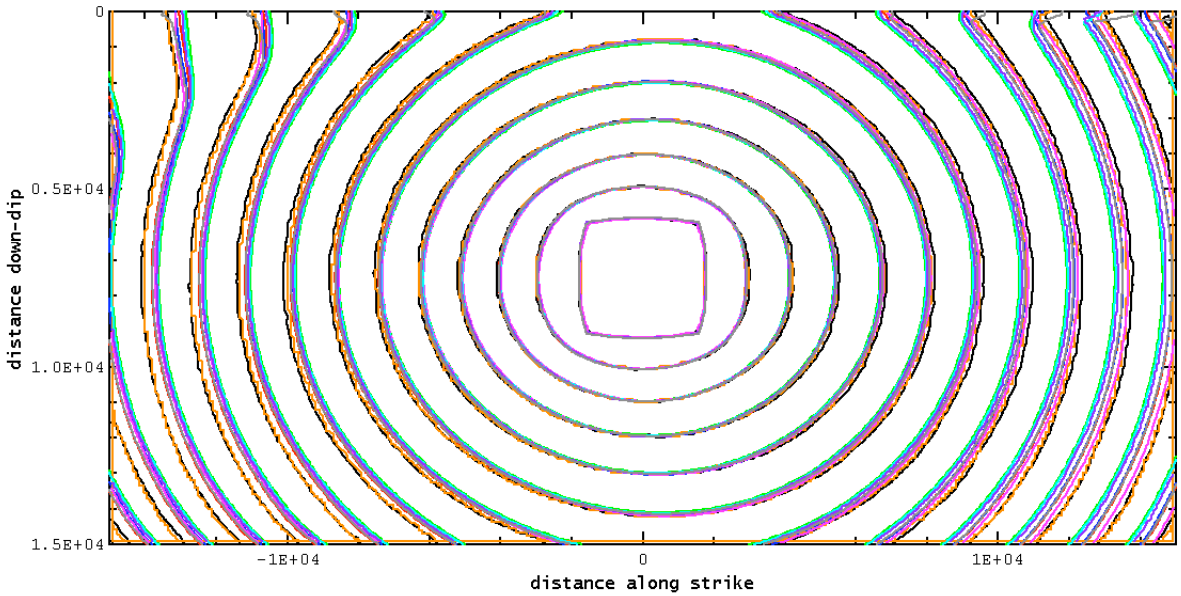

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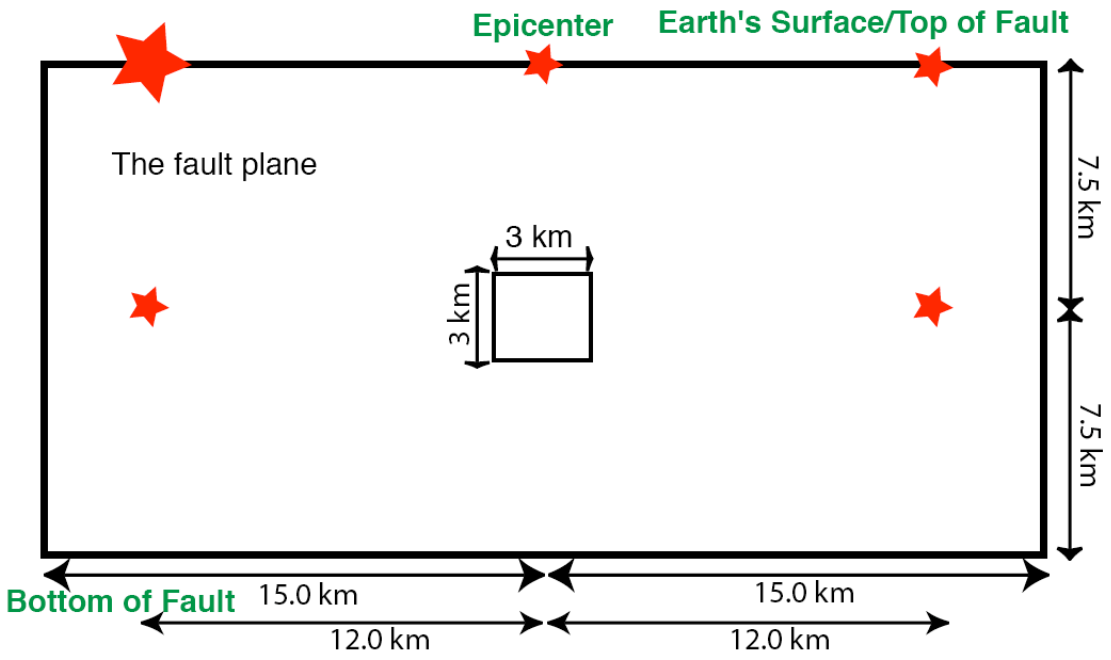

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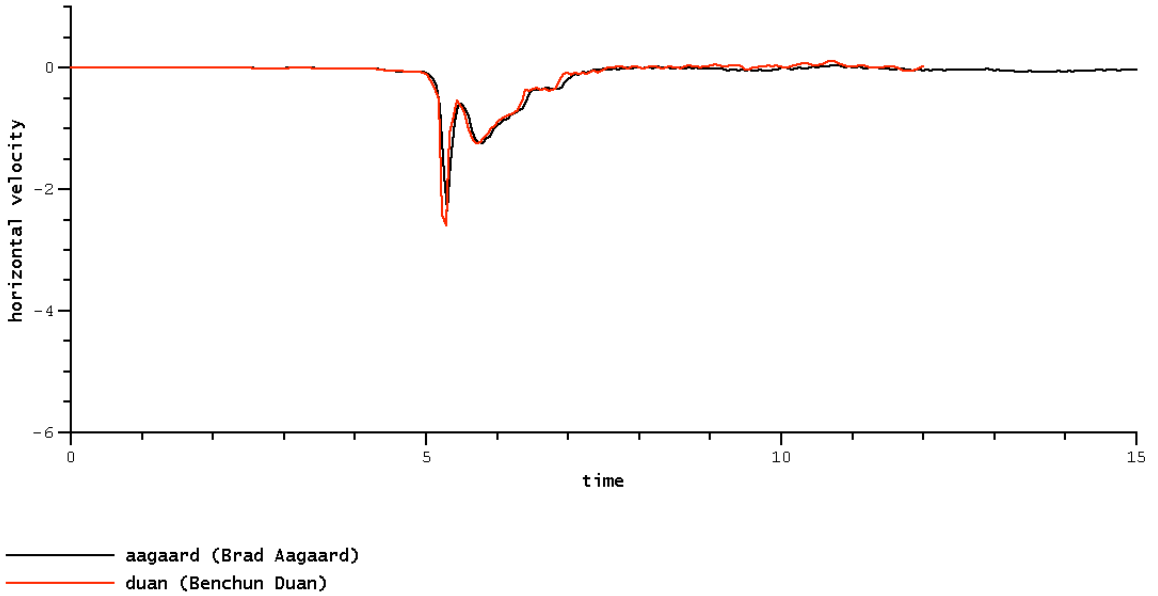

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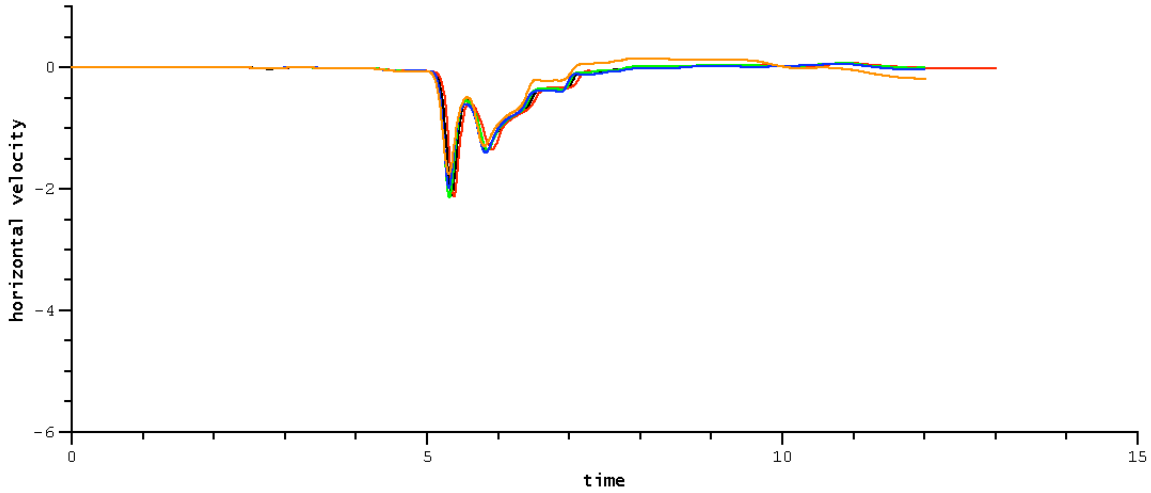

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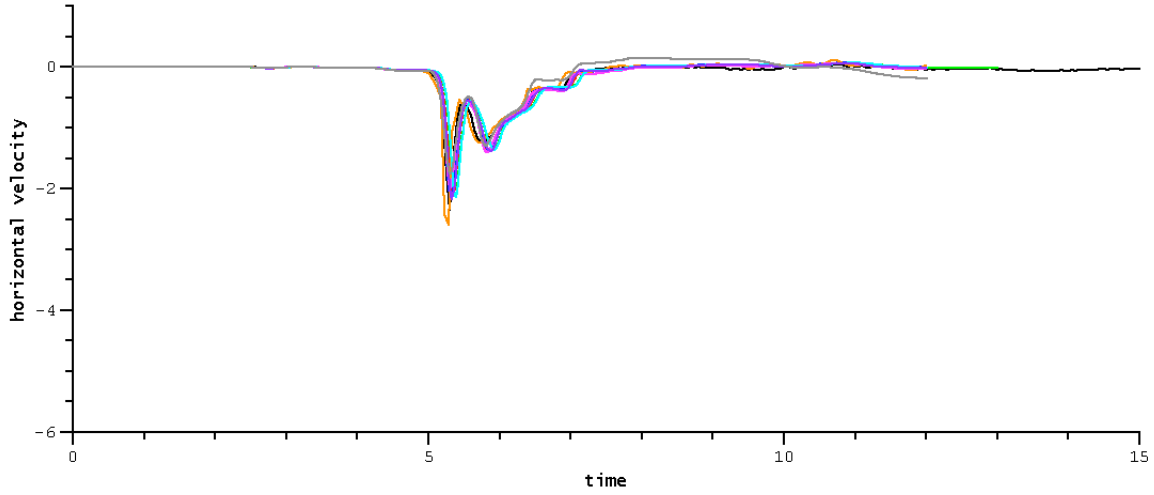

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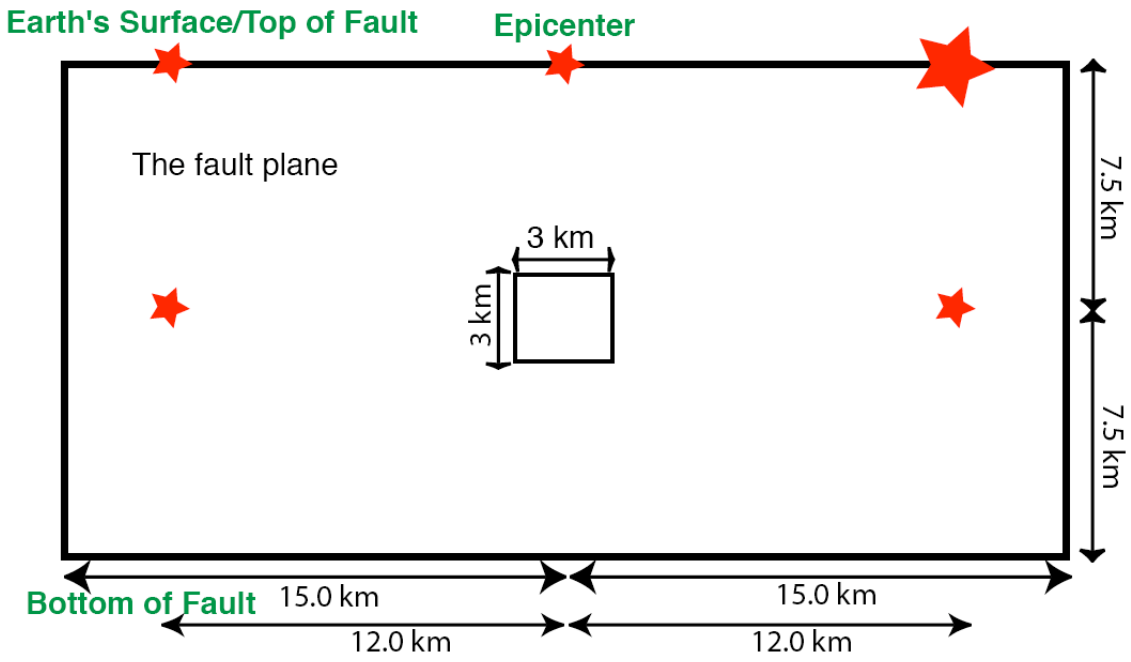

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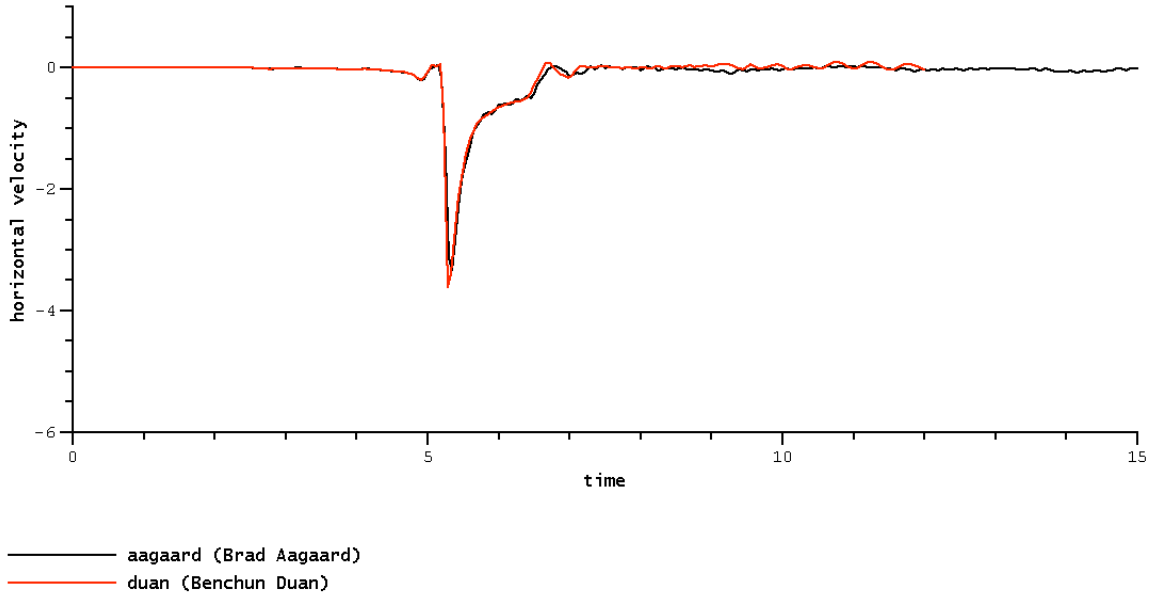

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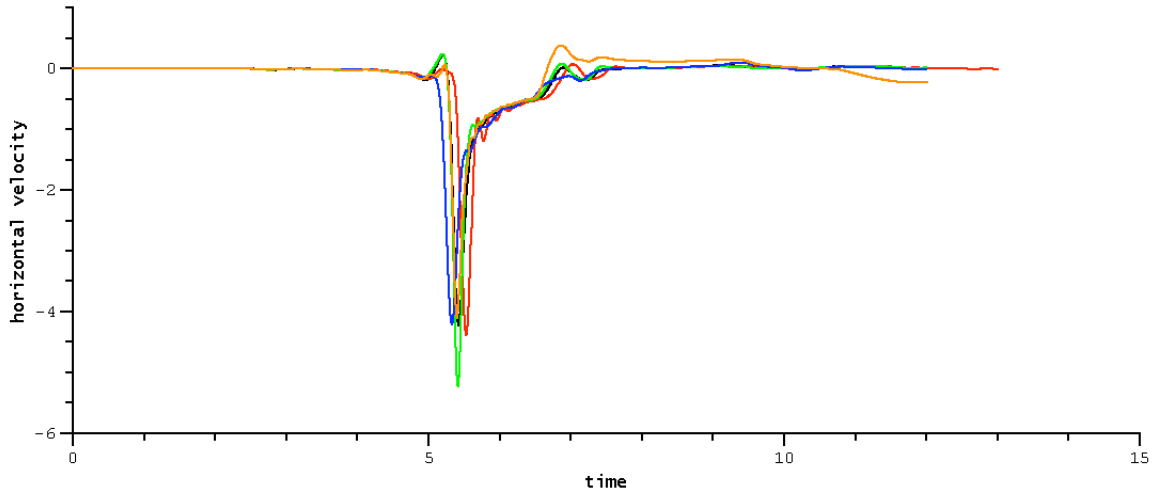

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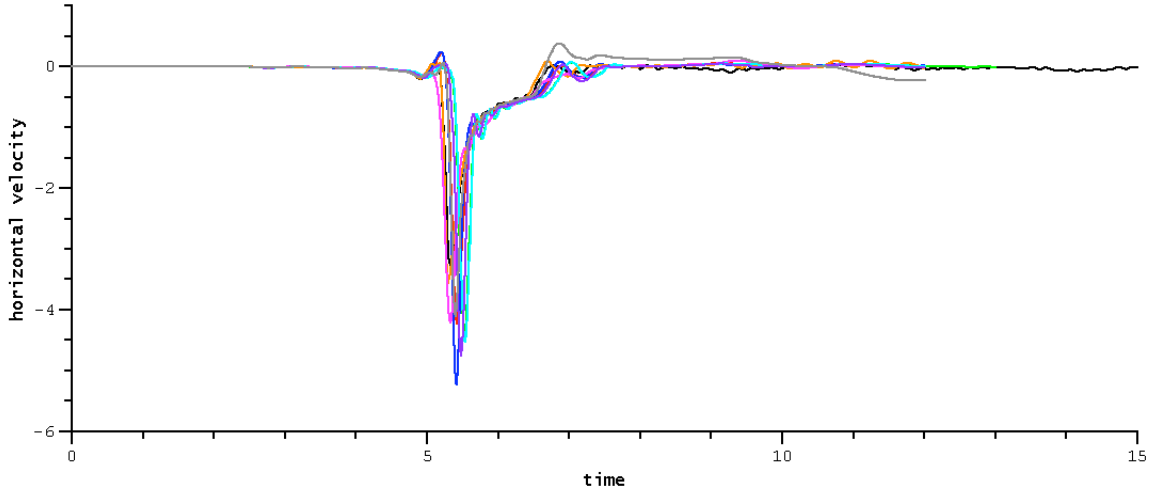

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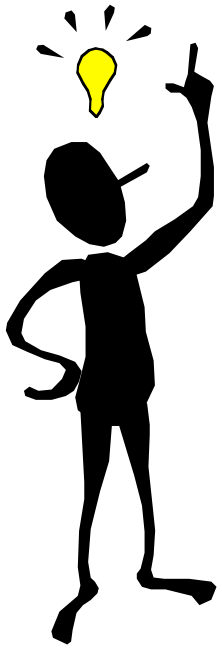
TIME FOR …….


Lively Discussion



Future Plans (Group Discussion)

New Benchmarks?

Website Additions?

Famous SRL Article?

The End