

Overview of the SEAS platform

<https://strike.scec.org/cvws/cgi-bin/seas.cgi>



The SCEC Sequences of Earthquakes and Aseismic Slip Project

[Benchmark Comparison Tool](#)

[Benchmark Descriptions](#)

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[Workshop Presentations](#)



Benchmark Descriptions

Click on the benchmark name for a detailed description and instructions to modelers.

| | |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BP1-QD | (Formerly BP1) 2D antiplane shear motion. The fault is a vertical strike-slip fault in a homogeneous halfspace. Friction is regularized rate-and-state friction with an aging law. |
| BP2-QD | (Formerly BP2) 2D antiplane shear motion. The fault is a vertical strike-slip fault in a homogeneous halfspace. Friction is regularized rate-and-state friction with an aging law. This benchmark explores the effects of varying the cell size. |
| BP1-ED | (Formerly BP3) 2D antiplane shear motion, with full elastodynamics. The fault is a vertical strike-slip fault in a homogeneous halfspace. Friction is regularized rate-and-state friction with an aging law. |
| BP4-QD | (Formerly BP4) (Updated 12/23/2019) 3D motion in a wholespace. The fault is a vertical strike-slip fault in a homogeneous wholespace. Friction is regularized rate-and-state friction with an aging law and radiation damping. |
| BP3-QD | 2D plane-strain motion, quasidynamic. The fault is a dipping normal fault in a homogeneous linear elastic halfspace. Friction is regularized rate-and-state friction with an aging law and radiation damping. |
| BP5-QD | 3D motion in a halfspace, quasidynamic. The fault is a vertical strike-slip fault in a homogeneous linear elastic halfspace. Friction is regularized rate-and-state friction with an aging law and radiation damping. |

Note: "BP1" stands for "Benchmark Problem 1."

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This page was last updated or reviewed on 26 September 2020.

For login/account information email Brittany (bae@uoregon.edu) or Junle (jiang@ou.edu)

Overview of the SEAS platform

<https://strike.scec.org/cvws/cgi-bin/seas.cgi>



Select Benchmark

Benchmarks

| Name | Date | Description | Action |
|--------|-------------------|--------------------------------------------------------|--------|
| bp1-fd | 9/26/2020 8:32 PM | 2D Antiplane Shear, Full Elastodynamics (formerly BP3) | Select |
| bp1-qd | 9/26/2020 8:28 PM | 2D Antiplane Shear (formerly BP1) | Select |
| bp2-qd | 9/26/2020 8:31 PM | 2D Antiplane Shear, Varying Cell Size (formerly BP2) | Select |
| bp3-qd | 9/26/2020 9:46 PM | 2D Plane Strain, Dipping Fault, Quasidynamic | Select |
| bp4-qd | 9/26/2020 8:33 PM | Strike-Slip Fault in a 3D Halfspace (formerly BP4) | Select |
| bp5-qd | 9/26/2020 9:53 PM | Strike-Slip Fault in a 3D Halfspace, Quasidynamic | Select |

Select User(s)

Benchmark: bp3-qd (2D Plane Strain, Dipping Fault, Quasidynamic)

| Users | | | |
|------------|------------------------------------------|--------|--|
| Name | Description | Action | |
| barbot | barbot_dip90 | Select | |
| barbot.2 | barbot_dip60 | Select | |
| barbot.3 | barbot_dip30 | Select | |
| cattania | dx=25m, dip=30 | Select | |
| cattania.2 | dx=25m, dip=60 | Select | |
| cattania.3 | dx=25m, dip=90 | Select | |
| erickson | dip 90, dx = 50m, Lx = 180km, Lz = 180km | Select | |
| erickson.2 | dip 60, dx = 50m, Lx = 180km, Lz = 180km | Select | |
| erickson.3 | dip 30, dx = 50m, Lx = 180km, Lz = 180km | Select | |

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[Logout](#)

Time-Series File

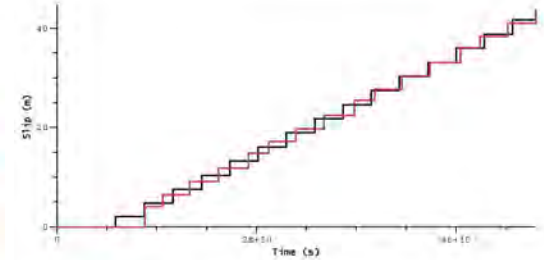
Benchmark: bp3-qd (2D Plane Strain, Dipping Fault, Quasidynamic)

File: Bst_dp000 (sd = 0.0 km)

Field: slip (Slip (m))

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— barbot (barbot_dip90)
— barbot.2 (barbot_dip60)

Graphing Preferences:

Superimpose graphs
 Plot size in pixels: width = 800, height = 400
 Curve thickness in pixels: 3
 Drop-pass filter frequency in Hz: (leave blank for no filter)
 X range: left = 0.0000000E+00, right = 4.79999035E+10
 Y range: bottom = 0.0000000E+00, top = 4.4642733E+01

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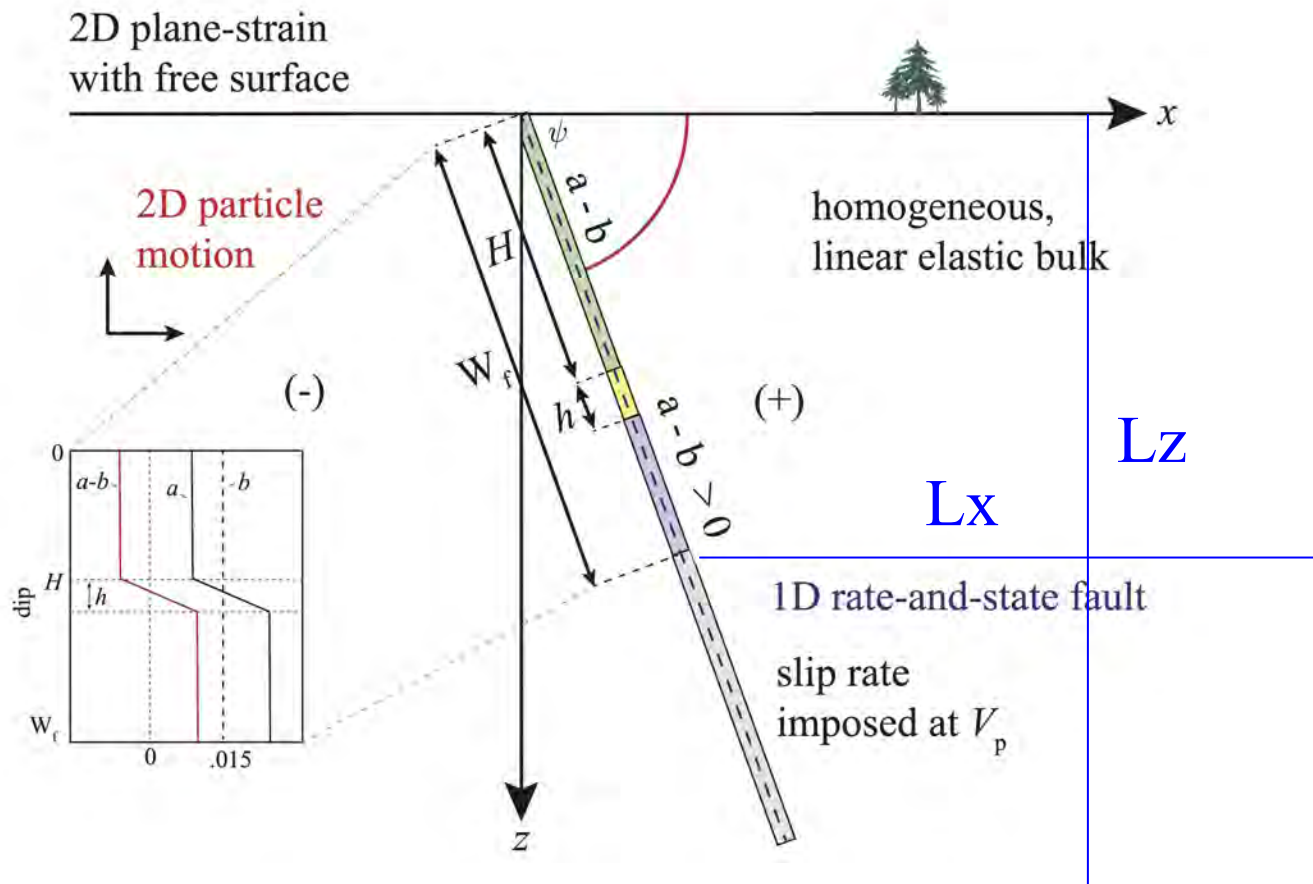
For login/account information email Brittany (bae@uoregon.edu) or Junle (jiang@ou.edu)

Session 2: Benchmark BP3-QD

- Overview of the problem
- Participating codes
- Slip profile comparisons
- Time series comparisons
- Discussion

BP3-QD:

Suggested **cell size**: 25m
Dip angles: 30, 60, 90
degrees



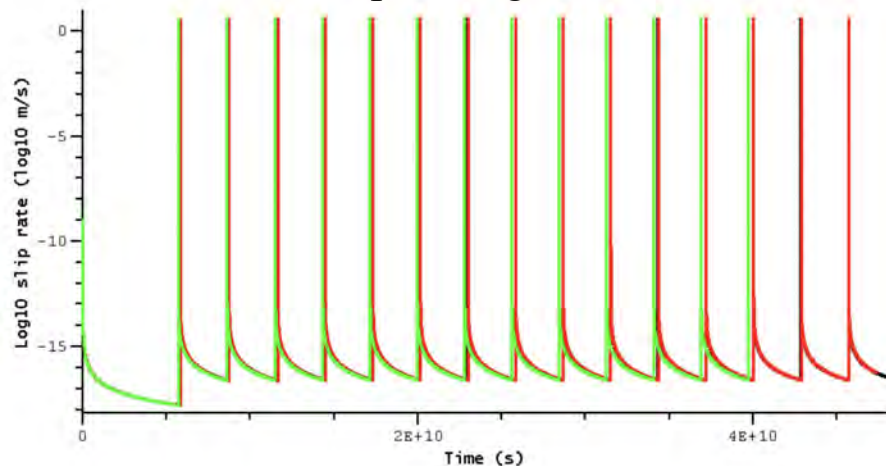
Thanks: Eric and Sylvain for help writing this benchmark problem.

BP3-QD: Overview of participating codes

- [modeler barbot]: Unicycle, BEM
- [modeler cattania]: FDRA, BEM
- [modeler erickson]: FDCycle, Finite Diff.

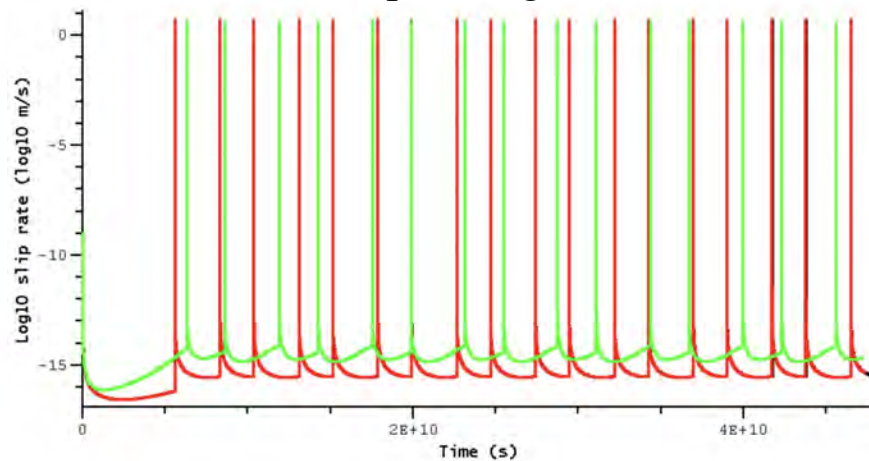
BP3-QD: Overview of on-fault time-series comparisons

Dip 90 degrees



— barbot (barbot_dip90)
— cattania.3 (dx=25m, dip=90)
— erickson (dip 90, dx = 50m, Lx = 180km, Lz = 180km)

Dip 30 degrees

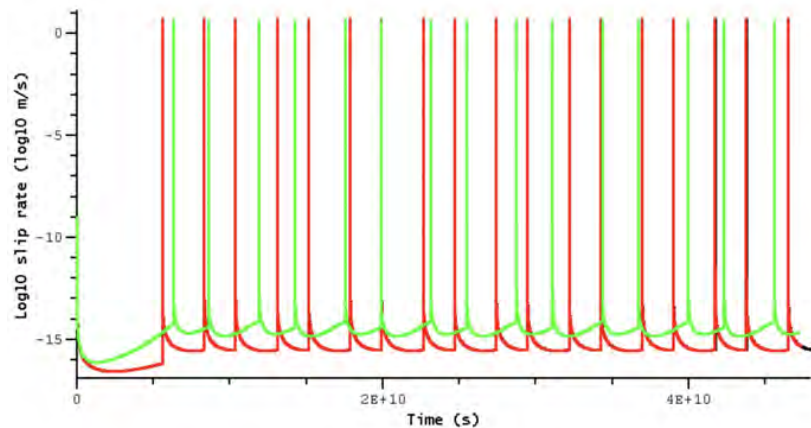


— barbot.3 (barbot_dip30)
— cattania (dx=25m, dip=30, thrust)
— erickson.3 (dip 30, dx = 50m, Lx = 180km, Lz = 180km)

Results with dip 90 degrees match well across groups, don't with dip 30 degrees. Why?

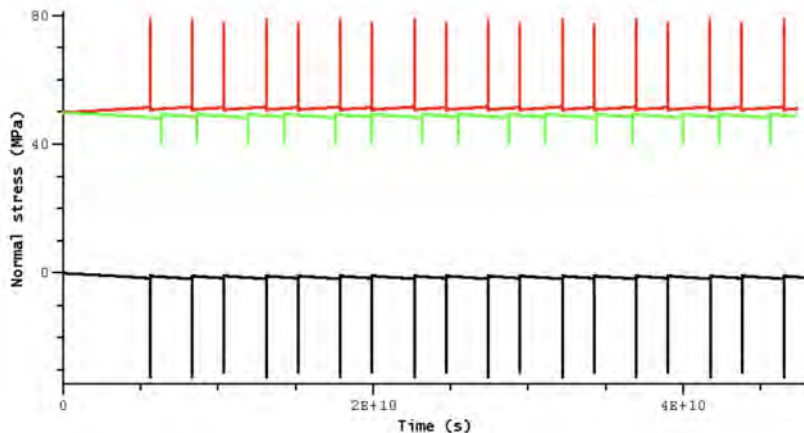
BP3-QD: Overview of on-fault time-series comparisons

Dip 30 degrees



— barbot.3 (barbot_dip30)
— cattania (dx=25m, dip=30, thrust)
— erickson.3 (dip 30, dx = 50m, Lx = 180km, Lz = 180km)

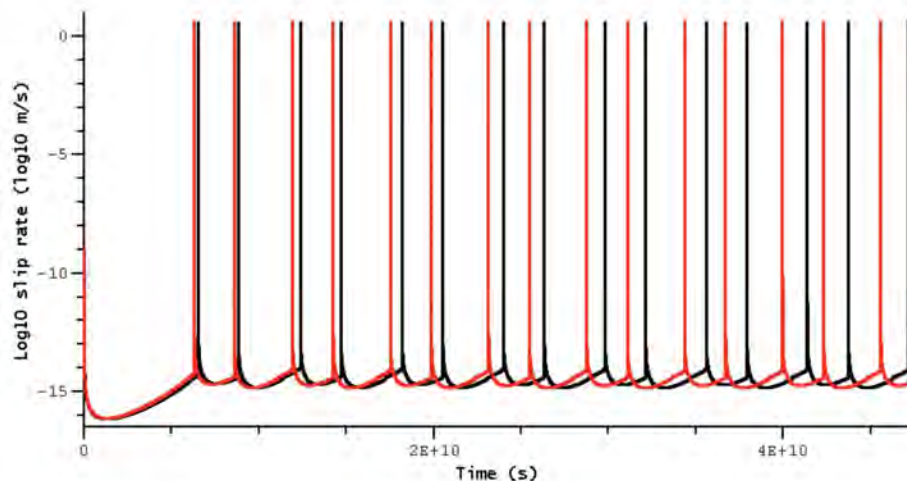
Dip 30 degrees



— barbot.3 (barbot_dip30)
— cattania (dx=25m, dip=30, thrust)
— erickson.3 (dip 30, dx = 50m, Lx = 180km, Lz = 180km)

Surface slip rate (left) and normal stress (right): sign discrepancies?

BP3-QD: Overview of on-fault time-series comparisons



— cattania.4 (dx=25m, dip=30, normal)
— erickson.3 (dip 30, dx = 50m, Lx = 180km, Lz = 180km)

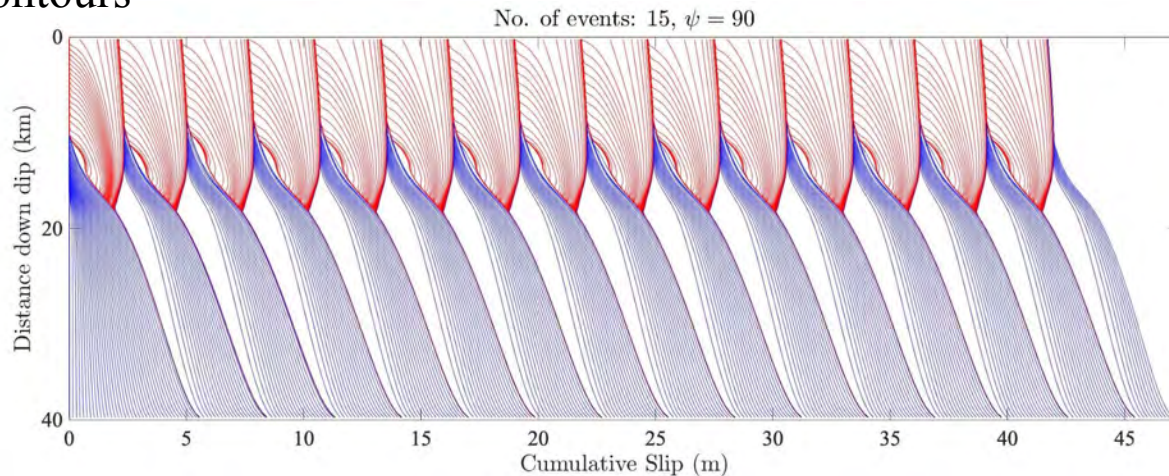
Results differ if thrust or normal faulting is assumed (this is not specified in problem description!)

Discrepancies still exist...

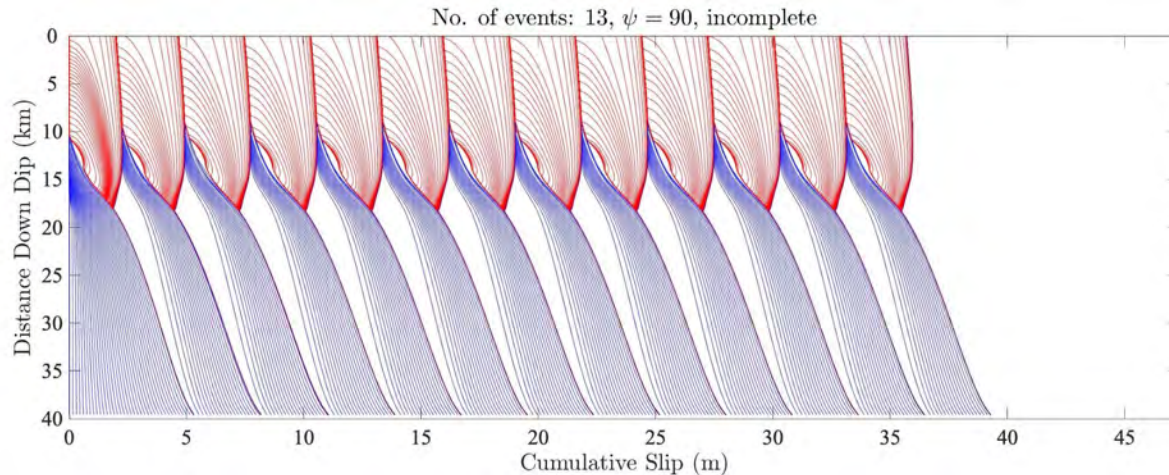
Dip 30 degrees: is the sense of slip normal or thrust?

BP3-QD: slip contours

cattania



erickson

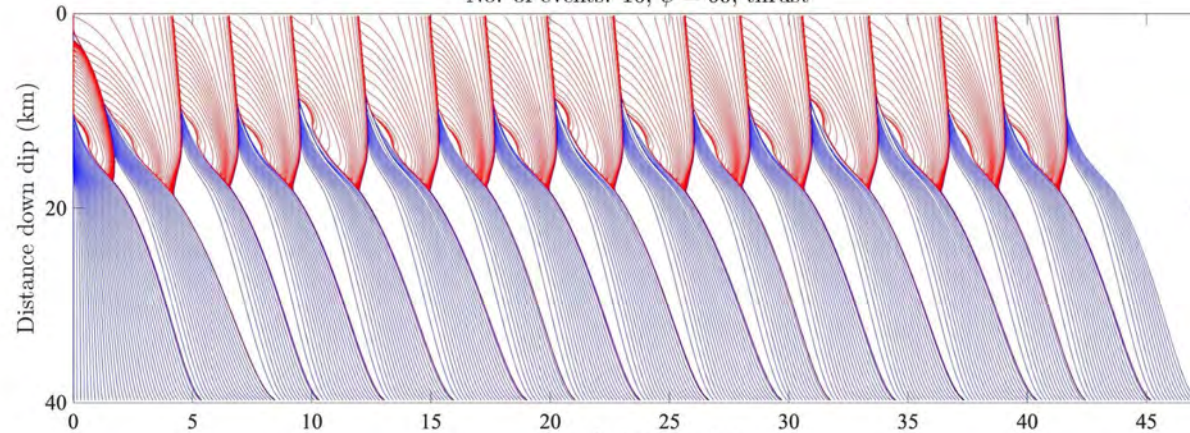


Results agree reasonably well in terms of nucleation depth, total slip.

BP3-QD: slip contours

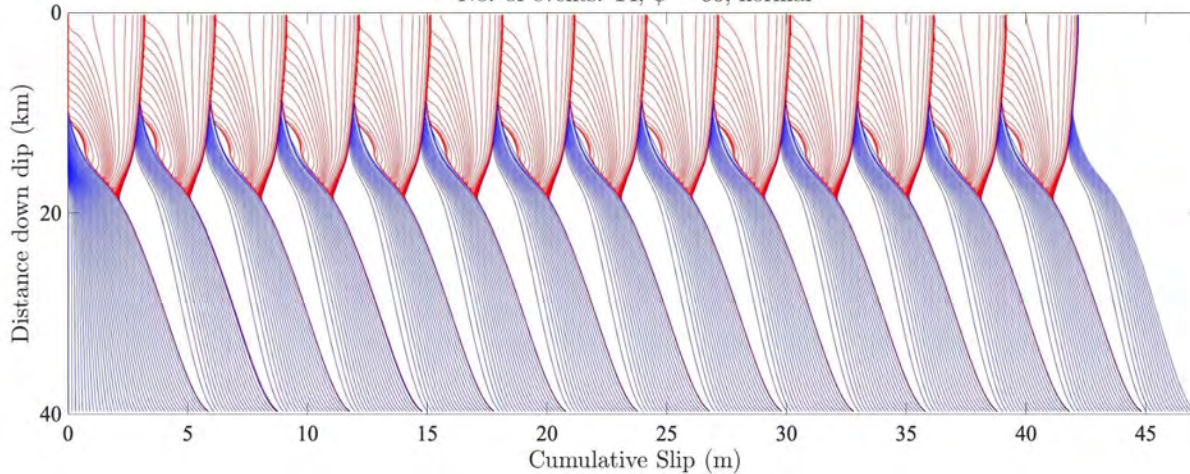
No. of events: 16, $\psi = 60$, thrust

cattania
(thrust)



No. of events: 14, $\psi = 60$, normal

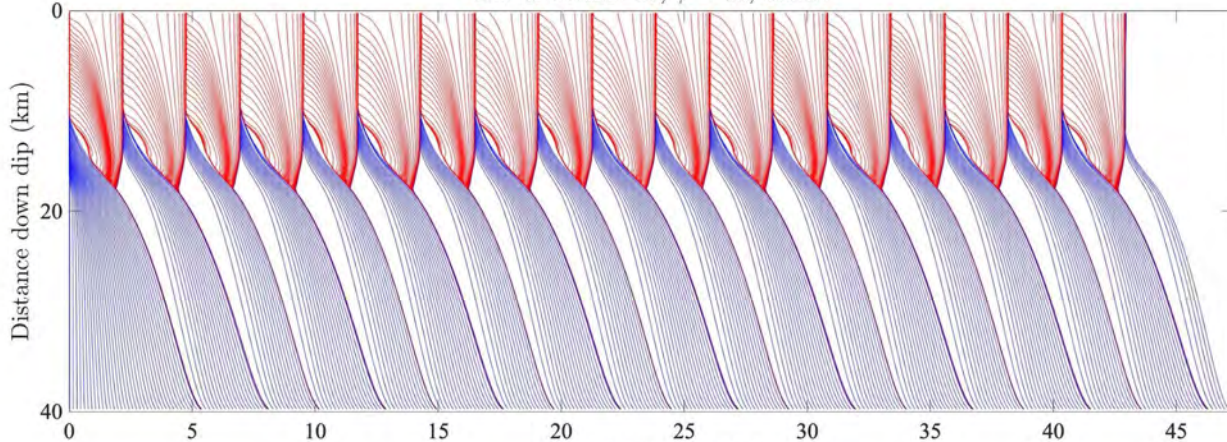
cattania
(normal)



BP3-QD: slip contours

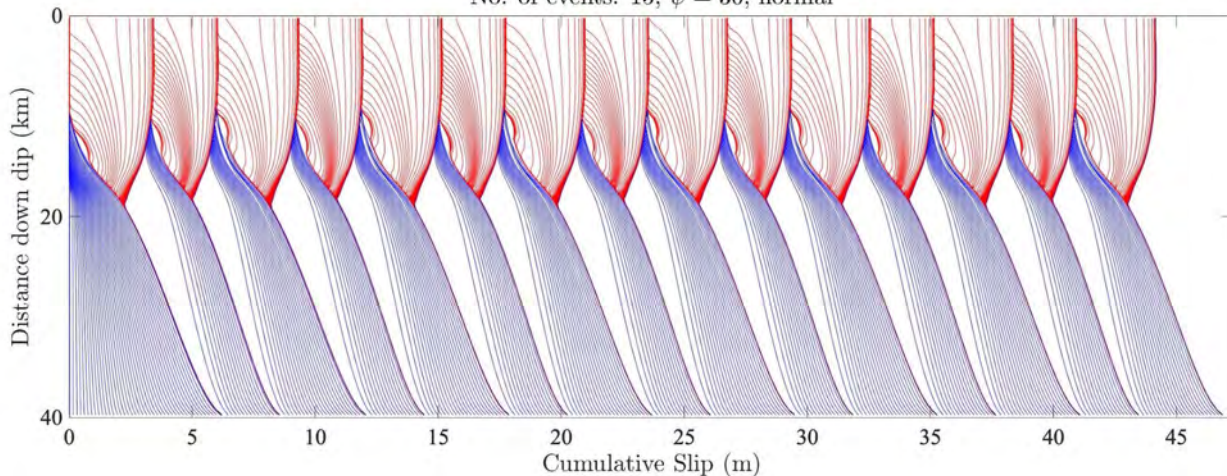
No. of events: 18, $\psi = 30$, thrust

cattania
(thrust)



No. of events: 15, $\psi = 30$, normal

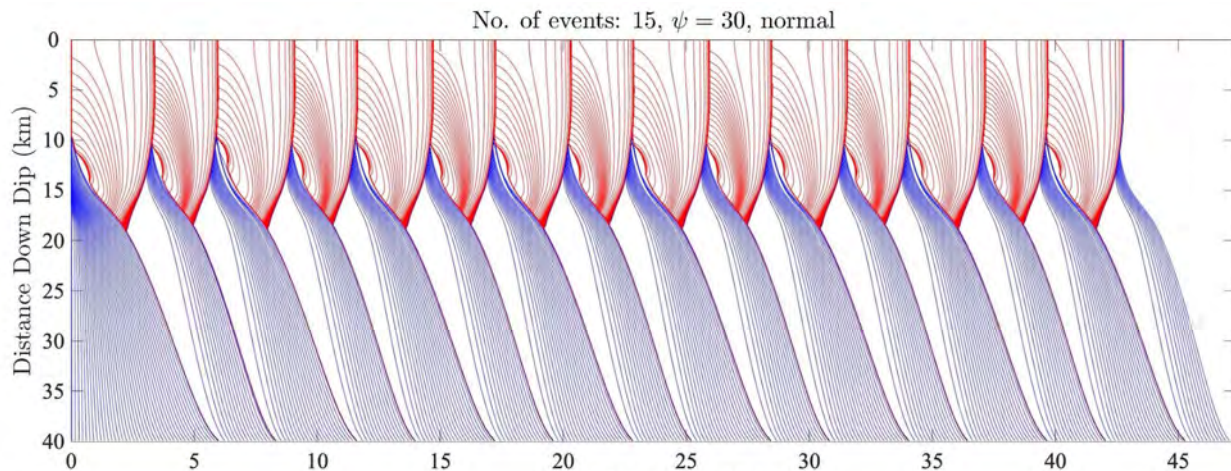
cattania
(normal)



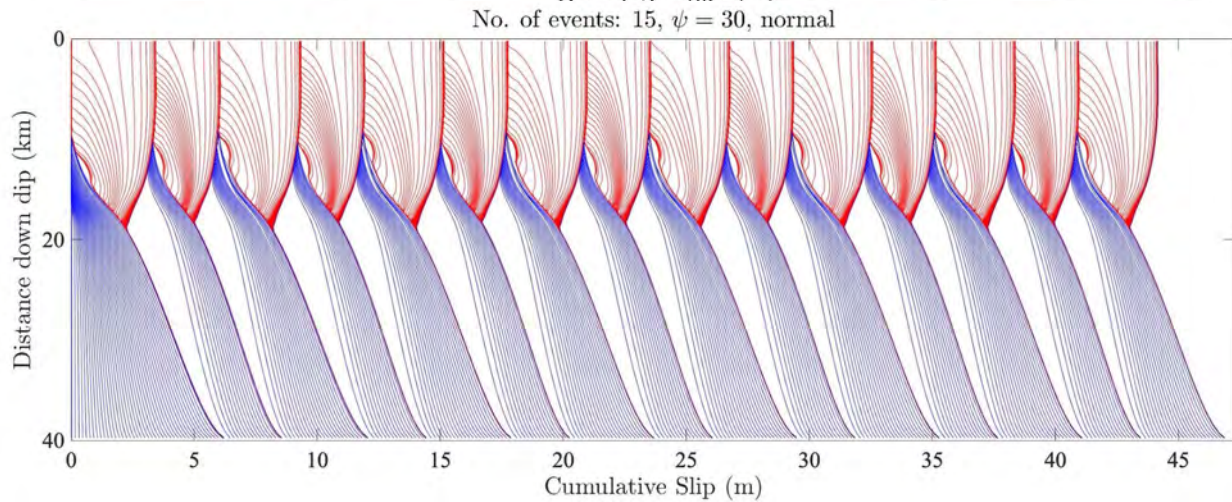
Camilla: Thrust faulting (increase in normal stress) decreases h^* leads to more events with less slip.

BP3-QD: slip

erickson



cattania



BP3-QD (To Do)

- specify thrust or normal faulting (or ask for both) in benchmark problem description.
- confirm sign conventions and check for errors.
- compare time series at off-fault surface stations (currently only have barbot results).
- for volume based codes explore dependency on computational domain size, cell size (need to get down to 25m).