

Cross-Laboratory Benchmarking of Fault Frictional Behavior

21 July 2026 (Virtual workshop)

10 August 2026 (informal GRC gathering)

29 August 2026 (In-person pre-SCEC working group meeting)

Srisharan Shreedharan (Utah State University)

Tamara Jeppson (USGS)

Heather Savage (UC Santa Cruz)



Statewide California Earthquake Center

SCEC award #26023

The genesis of this workshop...



IODP x405 JTrack, Fall 2024



SCEC CRM Workshop, Fall 2025

Every fault model needs a friction number

- **Friction coefficients, healing rates, rate-and-state parameters.**

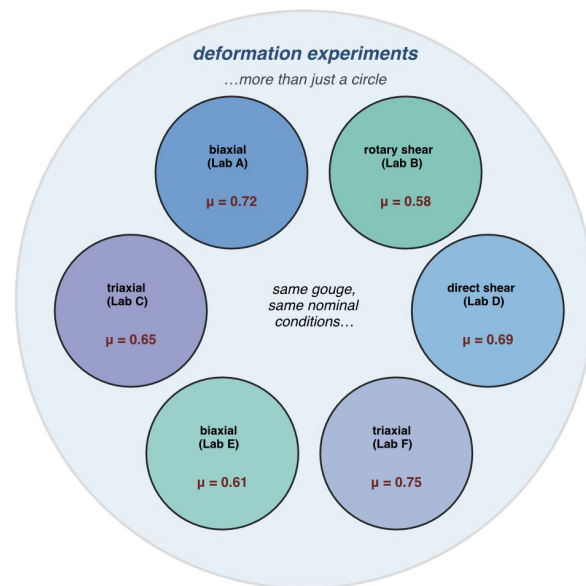
They all come from laboratory experiments.

- **SCEC CRM (and other tools/users) needs values.**

Laboratories do not always agree on it.

- **Until now, few studies quantified how much of this disagreement is real.**

Rock friction community does not currently have standard experiments to compare one laboratory against another.



Which value enters the CRM? Without inter-lab benchmarks, apparatus effects and material behavior may be indistinguishable.

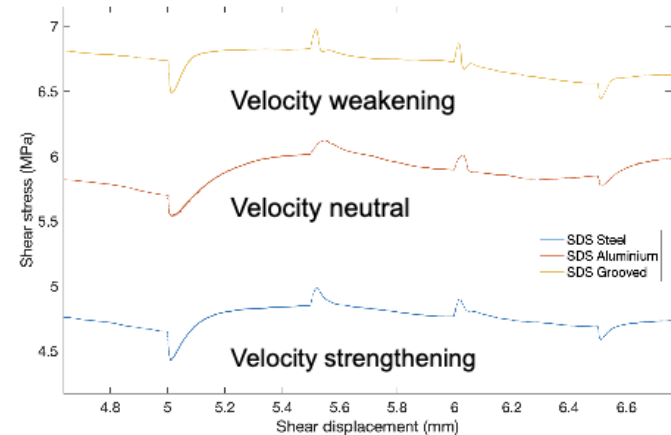
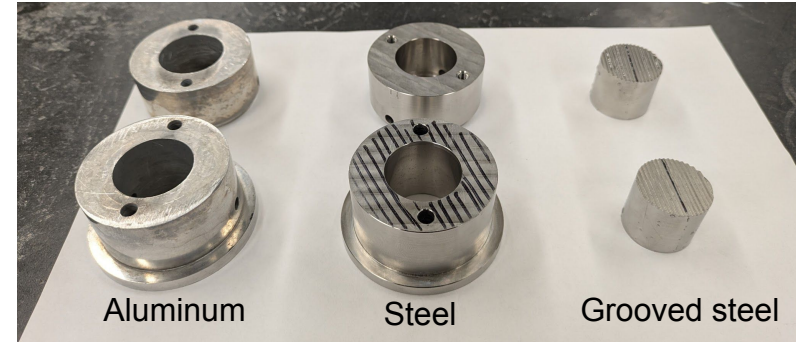
The *need* for benchmarking...

- **Same quartz powder, stress, apparatus.**
Friction changed with sample holder.
- **Velocity weakening to velocity strengthening, by holder alone.**
- **This is an old problem (Czichos et al., 1987, *Wear*).**

A 1987 alumina-on-alumina round robin, identical material in every laboratory, returned friction from ~ 0.2 to ~ 0.7 worldwide ($n = 31$).

**MULTILABORATORY TRIBOTESTING: RESULTS FROM THE
VERSAILLES ADVANCED MATERIALS AND STANDARDS
PROGRAMME ON WEAR TEST METHODS**

HORST CZICHOS, SUSANNE BECKER and JÜRGEN LEXOW
Bundesanstalt für Materialprüfung, Unter den Eichen 87, D-1000 Berlin 45 (F.R.G.)
(Received October 28, 1986; accepted October 28, 1986)



Goals of this initiative

- Defining **community-endorsed benchmarking workflows**
- Identifying **standard materials and experimental conditions**
- Establishing pathways for **data sharing and reproducibility**
- Connecting laboratory measurements to **numerical and seismic observations**

Virtual workshop (21 July 2026)

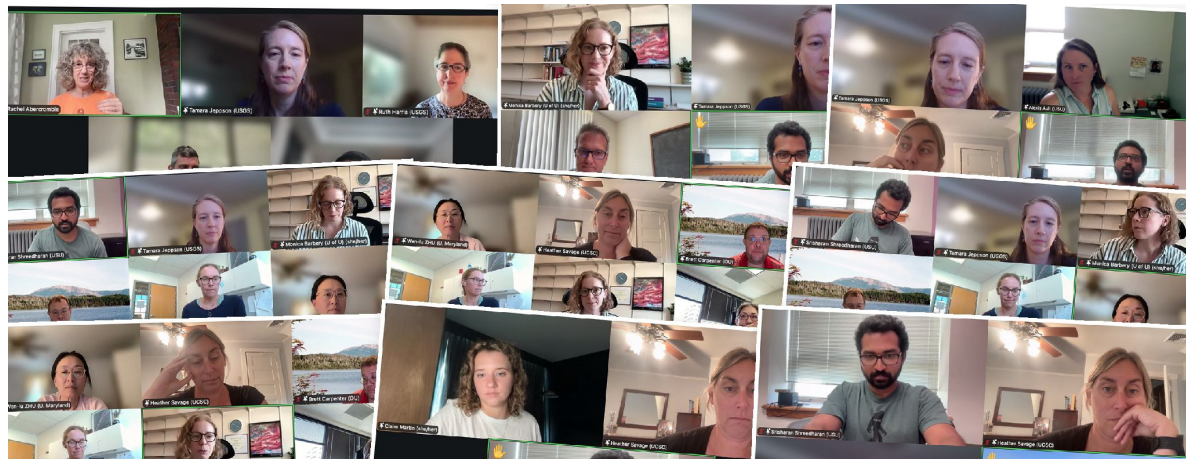


Date: July 21, 2026

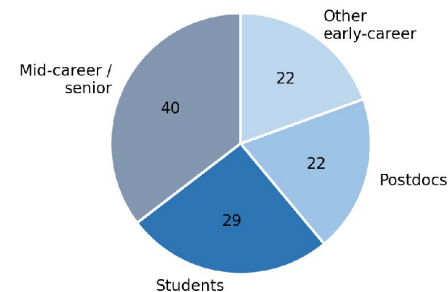
Location: Online via Zoom

Workshop Organizers: Srisharan Shreedharan, Tamara Jeppson, Heather Savage

SCEC Award: 26023

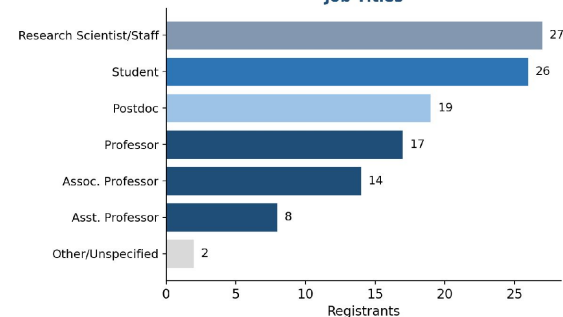


Career Stage (self-identified)



65% early-career researchers (73 of 113)

Job Titles

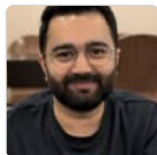


Working group meeting (29 Aug 2026)

2026 SCEC Cross-Laboratory Friction Benchmarking Workshop

Benchmark Experiment 1 (BE1) | DRAFT

S. Shreedharan, H. Savage, T. Jeppson and the working group



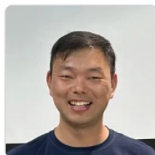
Karan Adhikari
U. Houston



Monica Barbery
U. Utah



Brett Carpenter
U. Oklahoma



Xiaofeng Chen
Oklahoma State



Melodie French
Rice



Ashley Griffith
Ohio State



Tamara Jeppson
USGS



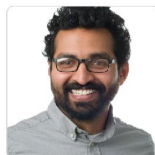
Hiroko Kitajima
Texas A&M



Nadia Lapusta
Caltech



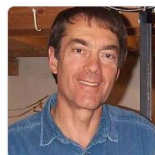
Heather Savage
UC Santa Cruz



Srisharan Shreedharan
Utah State



Rob Skarbek
PSI



Terry Tullis
Brown

Decisions on:

1. Sample standards
2. Experimental protocols and boundary conditions, and
3. Long-term archival of standard experiments, future-proofing for emerging labs, broad usage.

Long-term goals (What success looks like a year from now)

Select Benchmark

The SCEC Sequences of Earthquakes and Aseismic Slip Project

[Benchmark Comparison Tool](#)

[Benchmark Descriptions](#)

[Downloads](#)

[Workshop Presentations](#)

<https://strike.scec.org/cvws/seas/>

The SCEC/USGS Spontaneous Rupture Code Verification Project

[Benchmark Comparison Tool](#)

[Benchmark Descriptions](#)

[Newest Benchmarks](#)

[Metrics \(Version 1\)](#)

[Code Descriptions](#)

[Workshop Presentations](#)

<https://strike.scec.org/cvws/>

Benchmarks			
Name	Date	Description	Action
bp1-fd	9/26/2020 8:32 PM	2D Antiplane Shear, Full Elastodynamics	Select
bp1-qd	9/26/2020 8:28 PM	2D Antiplane Shear	Select
bp2-qd	9/26/2020 8:31 PM	2D Antiplane Shear, Varying Cell Size	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 Wholespace	Select
bp5-fd	4/14/2023 4:33 PM	Strike-Slip Fault in a 3D Halfspace, Fully Dynamic	Select
bp5-qd	9/26/2020 9:53 PM	Strike-Slip Fault in a 3D Halfspace, Quasidynamic	Select
bp6-qd-a	11/18/2021 4:00 PM	2D Antiplane Shear, Aging Law, Fluid Injection	Select
bp6-qd-c	11/18/2021 4:02 PM	2D Antiplane Shear, Constant Friction, Fluid Injection	Select
bp6-qd-s	11/18/2021 4:02 PM	2D Antiplane Shear, Slip Law, Fluid Injection	Select
bp7-fd-a	11/18/2021 4:21 PM	Planar Fault in a 3D Wholespace, Aging Law, Fully	Select
bp7-fd-s	11/18/2021 4:21 PM	Planar Fault in a 3D Wholespace, Slip Law, Fully	Select
bp7-qd-a	11/18/2021 4:20 PM	Planar Fault in a 3D Wholespace, Aging Law, Qua	Select
bp7-qd-s	11/18/2021 4:21 PM	Planar Fault in a 3D Wholespace, Slip Law, Quasi	Select

Select User(s)

Benchmark: bp1-fd (2D Antiplane Shear, Full Elastodynamics)

Users				Select Checked	Select All
	Name	Description	Action		
☐	bwang	Binhao Wang, auto switch QD/FD	Select		
☐	dalzilio	Luca Dal Zilio (dx=25m; Lx=80km; Lz=160km)	Select		
☐	dalzilio.2	Luca Dal Zilio (dx=25m; Lx=50km; Lz=50km)	Select		
☐	harvey	Toby Harvey (Lx=160km, Lz=160km, dz=50m)	Select		
☐	harvey.2	Toby Harvey (Lx=80km, Lz=80km, dz=50m)	Select		
☐	harvey.3	Toby Harvey (Lx=160km, Lz=160km, dz=37m, p=4)	Select		
☐	jiang	Junle Jiang (dz=25 m; Wf=80 km; SBEM)	Select		
☐	jiang.2	Junle Jiang (dz=25 m; Wf=160 km; SBEM)	Select		
☐	jiang.3	Junle Jiang (dz=25 m; Wf=320 km; SBEM)	Select		