



Introduction: Advancing Simulations of **S**equences of **E**arthquakes and **A**seismic **S**lip (**SEAS**)

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SCEC SEAS Workshop, Jan 9, 2020



SEAS Goals

The goal of the SEAS initiative is to promote advanced models with robust physical features—a large spectrum of rupture styles and patterns, including slow-slip events, complex earthquake sequences, fluid effects, dynamic stress changes, and inelastic deformation.



Past & current activities

With SCEC funding in 2018, we:

- Developed the second Benchmark Problem BP2 to investigate resolution issues
- Held a second SEAS-themed workshop to discuss results of BP2 in Nov. 2018
- Received and analyzed >80 submissions from 11 modeling groups

With SCEC funding in 2019, we:

- Had our first SEAS paper (based on BP1 and BP2) accepted to SRL (in press currently)
- Added rupture time contour functionality to online platform
- Developed 3rd and 4th Benchmark Problem BP3 and BP4 and have received submissions (for each) from 4 modeling groups
- Third SEAS-themed workshop (this workshop) based on BP3/BP4



Past & current activities

Recent/current activities:

- presented posters at 2019 SCEC and AGU annual meetings
- submitted proposals for the design of BP5-6 and a 2020 SEAS workshop
 - BP5: 2D plane-strain problem on a dipping fault (?)
 - BP6: 3D problem in a half-space (?)
- Received and analyzed > 10 submissions from 4 modeling groups for BP3
- Received and analyzed > 10 submissions from 4 modeling groups for BP4



Timelines for future activities

Proposals for 2020

- SEAS verification exercises for BP5-BP6 in SCEC5: Pending
 - Co-PIs: Erickson, Jiang, and Barall
 - Other modelers request separate funding from SCEC or others
- One-day SEAS-themed workshop in 2020: Pending



Workshop agenda

THURSDAY, JANUARY 9, 2020

08:30 - 09:00 Workshop Check-In

Session 1: Overview of SEAS Group and Progress in SEAS Science

09:00 - 09:10 Welcome and Overview of Workshop Objectives

09:10 - 09:30 Slip complexity on faults with heterogeneous friction

09:30 - 09:50 Anatomy of the Main Himalayan Thrust: Bridging long-term tectonics and short-term seismicity

09:50 - 10:10 Linked subduction, dynamic earthquake rupture, and tsunami modeling

10:10 - 10:30 Discussion

10:30 - 10:40 *Break*

Session 2: Community Code Comparison and Verification Exercises

10:40 - 11:00 Comparing results of diverse earthquake simulators with one another and with earthquake data

11:00 - 11:30 Review of SEAS benchmarks BP1 and BP2 results

11:30 - 11:50 Code verification using the method of manufactured solutions

11:50 - 12:00 Discussion

12:00 - 13:00 *Lunch*

Session 3: SEAS Benchmark BP3 - Inertial effect

13:00 - 14:10 Benchmark results and discussion

14:10 - 14:20 *Break*

Session 4: SEAS Benchmark BP4 - 3D effect

14:20 - 16:00 Benchmark results and discussion

15:50 - 16:00 *Break*

Session 5: Future SEAS Group Activities

16:00 - 17:00 Future benchmarks and publications

17:00 - 17:30 Discussion

17:30 Workshop Adjourns

Brittany Erickson / Junle Jiang

Sohom Ray (Dalhousie)

Luca Dal Zilio

Betsy Madden (Brasilia)

All

Terry Tullis

Brittany Erickson / Junle Jiang

Jeremy Kozdon

All

Brittany Erickson

Junle Jiang

Brittany Erickson / Junle Jiang

All



Introductions