



Research Highlight

Coupling mantle convection (ASPECT) to lithosphere and surface processes to understand North American tectonics

Dramatic topographic extension, an unparalleled suite of data from field observations and EarthScope, and well-constrained plate boundary evolution make the western United States a world-class natural laboratory for studying the thermomechanical processes of extensional collapse. The present-day Basin and Range province of Southwestern North America (SWNA) is the product of this complete period of extension. The extensional period is generally recognized to consist of an early phase in latest Eocene-Oligocene, in which metamorphic core complexes formed through evolution of low-angle normal faults that eventually exhumed highly sheared middle-crustal rocks (Bahadori and Holt, 2019).

In a pair of studies we model mantle flow using ASPECT (Advanced Solver for Problems in Earth's Convection) (Figure 1a,b) and couple output stress field to a lithosphere model using UWG (Underworld Geodynamics) (Beucher et al., 2019) (Figure 1c,e). The modeling incorporates non-linear visco-plastic behavior of the lithosphere, and it accounts for the weakening effects of crustal partial melting, and mantle flow related dynamic topography (Figure 1c). Implementation of external forcings like upper crustal velocities, paleoclimate, and sea-level fluctuation drive landscape evolution in the Badlands code (Salles, 2016) including sedimentation and erosion, which feed back into the lithosphere model.

Our simulations for the SWNA result... [\[full article\]](#)

contributed by

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From HQ

Dear Community,

We are excited to welcome Mohammed Gouiza to the CIG HQ Staff. Moh most recently was a Research Fellow at University of Leeds where he lead the Geodynamics and Basin Evolution group. His experience in teaching and modeling lithospheric processes will be a great asset as he joins Rene Gassmoeller (UFL) and us at CIG HQ in developing new capabilities in education, training, and software.

Bruce Buffet & Lorraine Hwang, Directors

News

2023 The Year of Open Science

The Office of Science and Technology Policy (The White House) has declared 2023 the [Year of Open Science](#) to advance open and equitable research, including new grant funding, improvements in research infrastructure, broadened research participation for emerging scholars and expanded opportunities for public engagement. Federal agencies are participating through a variety of actions. This includes the NSF GEO funding opportunity *Geosciences Open Science Ecosystem* ([NSF GEO](#)), NASA *Transform to Open Science* ([TOPS](#)), and the upcoming USGS Community for Data Integration Workshop (CDI) [Open Data for Open Science](#). Also see the [CENDI resource](#) to stay informed on [funding opportunities](#) across federal agencies.

Speaker Series

Do you know someone who would be a great ambassador for CIG research? The CIG Speaker Series is looking for talented speakers who can promote computational modeling in geodynamics and related earth sciences to a broad scientific audience. Open a [ticket](#) and include on the first

Governance

Elections

Please join us in welcoming Louis Moresi, Marc Speigelman, and Phaedra Upton to the Executive Committee (EC) and Adam Holt, Elvira Mulyukova, and Emmanuel Njinju to our Science Steering Committee (SSC). Many thanks to outgoing EC members Claire Currie, Bruce Buffet and Carolina Lithgow-Bertelloni for their leadership on the EC and SSC members Juliane Dannberg, Scott King, and John Naliboff for their contributions to the community as well as everyone who participated by running and voting in this year's elections.

Working Groups

CIG seeks to engage its community and encourage new ideas by seeking members interested in participating as a member of a current working group or starting a new Focused Working Groups (FWG). New FWG's should address a specific topic and have a clearly defined scope e.g., workshop, white paper, benchmark, etc. A WG should define concrete outcome(s) achievable within a short time frame, < 2 years. Anyone can propose one! We look forward to your ideas in continuing the CIG community's dynamic leadership in the Earth sciences. [[apply](#)]

Events

Fault Mechanics for Numerical Modeling Webinar Series ***NEW***

This webinar series highlights the recent discoveries in rock and fault mechanics from field observations and laboratory experiments that may inform and improve numerical models of the seismic cycles and short-term crustal deformation. The presentations cover advanced topics related to the importance of lithology, texture, and temperature on fault mechanics, the role of fluids in fault zones, and new observations on dynamic ruptures, foreshocks, and aftershocks in the laboratory. Isolating these effects in the laboratory and in the field will help the formulation of new constitutive laws for fault friction and the behavior of the surrounding rocks, allowing more realistic models.

All webinars begin at @1p PT beginning Friday February 17 (*tentatively*) through June.

See our [calendar](#) for details on all events and registration.

A full listing of all webinars can be viewed by navigating to [Outreach > Webinars](#)

Webinars

February 9 Tobias Keller, ETH ***10A PST

March 9 Chase Million, Million Concepts

April 13 Adina Pusok, Oxford University

May 11 SZ4D

CIG Monthly Webinars are the second Thursday of the month at 2P PT unless otherwise noted.

Workshops

June 11-17 PyLith Hackathon Golden, Colorado

June 12-16 Rayleigh Hackathon Golden, Colorado

July 6-15 ASPECT Hackathon Lincoln City, Oregon

Registration for Workshops will be announced as they become available.

Remember to join our [forum](#) to receive announcements for these and other 2022-2023 events.
