



Research Highlight

ASPECT: surface processes and basin formation through a two-way coupling with FastScape

The FastScape-ASPECT coupling is a two-way coupling that allows the landscape evolution model FastScape to deform the surface of ASPECT. Geodynamic models commonly simulate surface motions by using either a free surface or a sticky air layer. Either method can produce unrealistic highs or lows in the topography because they do not account for erosional and depositional processes that redistribute surface material through time. This redistribution not only helps obtain realistic topographies, but the change in surface loading can have widespread effects on model evolution, such as lengthening the time a fault remains active (Olive et al., 2014), promoting model asymmetry and rift migration, or altering the thermal state through sediment blanketing.

FastScape is an open-source code available in multiple languages (Fortran, C++, and Python; Braun and Willett, 2013) that deforms a surface through routines that mimic geomorphic processes. This is primarily done using three methods: 1) hillslope diffusion, 2) the Stream Power Law (SPL), and 3) marine transport. On the continents, hillslope diffusion will move ... [\[continued\]](#)

contributed by

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Connecting with Governance

Dear Community,

As we reach the end of the third five-year grant that has financially supported CIG, it is natural to stop and reflect on the scientific progress that this support has been enabled. To help document that progress, this spring the community provided a number of [one-page research highlights](#), illustrating the breadth and impact of CIG on solid earth sciences. Reading through these projects, I want to share my reflections on where CIG stands.

First, these highlights describe almost 50 projects involving more than 125 researchers using nine different CIG-supported software packages. They describe projects ranging from the innovative use of geodynamics software in the classroom to algorithmic development that will be critical to solve the next generation of geodynamic problems.

CIG software has been used to study geological processes across the globe and beyond, including: a structurally complex anticline in Northern Iraq using full-wave-form Inversion, the origin of strike-slip faulting the Aegean, subduction and delamination beneath the Apennines, delamination beneath the western Mediterranean, the origin of Cameroon Volcanic line, the origin of the Canary Islands, the evolution of the Malawi rift, the San Andreas fault, a variety of studies of western North America, imaging the Alaskan lithosphere, sea level indicators above a slab window in southern Argentina, a large-scale seismic inversion for the North Island, New Zealand, the origin of intraplate earthquakes in the Korean Peninsula, crustal resurfacing on Venus, and seismic waves generated by impacts on Mars. Other studies have investigated the effect of core size on dynamo generation, the impact of crystal orientation on flow, magma dynamics, formation of rifted continental margins, and earthquake rupture processes. These highlights are only the tip of the iceberg, isostatically speaking, as I can think of many other papers over the past five years describing research that was enabled by CIG software that are not represented.

Having been around since CIG was formed, I have watched CIG evolve and grow. We initially envisioned that CIG would host a team of software engineers who would provide well-documented, open-source software tools for the geodynamics community. I don't think any of us who were involved in the formation of CIG really knew how to define 'the geodynamics community.' Almost half of the research highlights

submitted this year use seismic tools, something we would not have envisioned 15 years ago. Most researchers today see CIG as an organization that brings communities of researchers together; geoscientists, software engineers, and applied mathematicians collaboratively work on CIG projects. Some of our most successful activities are hackathons, software tutorials (both in person and virtual), our software citation efforts, and software best practices guidelines. These are not the activities we envision at the start of CIG. As we look to the future, we must make sure that we are a welcoming community for all researchers and we must become a community where people feel that they belong. To help enable this we are thinking about how we can make geodynamics research and computational resources accessible to researchers who don't have access to leadership-class computing resources.

At the beginning of this column I mentioned the financial support that NSF provides and this has been an essential catalyst for CIG; however, many of you reading this newsletter (along with many others) have volunteered your time, energy, and knowledge; without these contributions CIG could not have been successful. This is not said nearly as often as it should be: thanks to all of you who have given one of your most precious resources, your time, to help make CIG the community it is today.

Scott King, Chair, Science Steering Committee

News

CIG Business Meeting

This year's CIG Business Meeting will be a virtual event on Thursday November 18 @ 1P-2:30P PT. The Annual Business Meeting is your chance to catch up on past activities and hear about 2022 activities. Results of the 2021 elections will be announced. In addition, join the breakout discussions to provide feedback on collaborations, engagement, and issues in justice, equity, diversity and inclusion.

To attend, remember to register prior to the meeting. [[register](#)]

SMOREs

Become a mentor!

The Summer Modeling Research Experiences program provides opportunities for undergraduate researchers in geodynamics. The program aims to increase diversity and competency in Earth and computational science and targets recruiting towards underrepresented students in STEM. Building on our highly successful first year, we are actively recruiting for mentors for 2022. See the program [website](#) to learn more about 2021 SMOREs. If you are interested in becoming a mentor or have questions, please contact [Lorraine](#) by December 31, 2021.

AGU Abstracts

Presenting at the 2021 Fall AGU meeting? Help fellow scientists find your research by including your abstract in the list of CIG related presentations. Check the list. If you cited CIG software in your abstract, your presentation may already be included. To list your presentation, send your abstract link to: events@geodynamics.org

AGU Awards

Congratulations to the following community members who have been recognized by AGU for their outstanding work in their field:

Jason Morgan Early Career Award
Juliane Dannberg, University of Florida

Francis Birch Lecture
Taras Gerya, ETH Zurich

Governance

Elections

2021 Elections are now open for positions on the Executive and Science Steering Committees. Candidates for the 2 open seats on the Executive Committee are: Seat 1. Louis Moresi or Carolina Lithgow-Bertelloni; Seat 2. Brad Aagaard or Daniel Peter. Candidates for the 4 open seats on the Science Steering Committee are: Seat 1. Harriet Lau or Joyce Sim; Seat 2. Peter Driscoll or Rakesh Yadav; Seat 3. Dave May or Anne Reinartz; and Seat 4 (2 year). Ebru Bozdog or Qinya Liu. View the [Candidate Statements](#). Contact your [Member Representative](#) to vote. Many thanks to EC member Katie Cooper and Louis Moresi and SSC members Ebru Bozdog, Min Chen, Krista Soderlund, and Cian Wilson for their contributions to the community. Voting closes **November 11, 2021**.

Call for Focused Working Groups

CIG seeks to encourage new ideas from the community by forming Focused Working Groups (FWG). FWG's should address a specific topic and have a clearly defined scope e.g. workshop, white paper, benchmark, etc. A FWG 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. [[email](#)]

Events

Webinars

Webinars are held the second Thursday of the month at 2P PT. Please see our [website](#) for connection information.

October 14 SMOREs Showcase
November 11 Veterans Day
November 18 CIG Business Meeting @ 1P PT
December none - AGU
January 12 Raj Moulik, *Princeton University*
February 9 Ryan Orvedahl, *UC Davis*
March 9 Kali Allison, *UC Davis*
April 13 Robert Walker, *SUNY Buffalo*
May 12 *tbd*

Remember to join our forum to receive announcements for these and other 2021-2022 events.