

## **Long – Term Tectonics group**

### **General summary:**

This group was organized fairly recently. The WG has been having conference calls (most recently April 3) and held a meeting in December at AGU. They may hold a meeting at the next GSA.

### **Working Group:**

**Dennis Harry, co-lead (Colorado State U.)**

**Mousumi Roy, co-lead (U. New Mexico)**

Thorsten Becker (U. of Southern California)

Todd Ehlers (U. of Michigan)

Noah Fay (U. of Arizona)

Ritske Huisman (Bergen U.)

Carolina Lithgow-Bertelloni (University College, London)

Dietmar Muller (U. of Sydney)

Patrice Rey (U. of Sydney)

Jolante van Wijke (Los Alamos)

The software focus has been on GALE. The WG has been working with Walter Landry to solve a variety of technical issues, run benchmarks, and improve documentation.

The WG has identified several priorities:

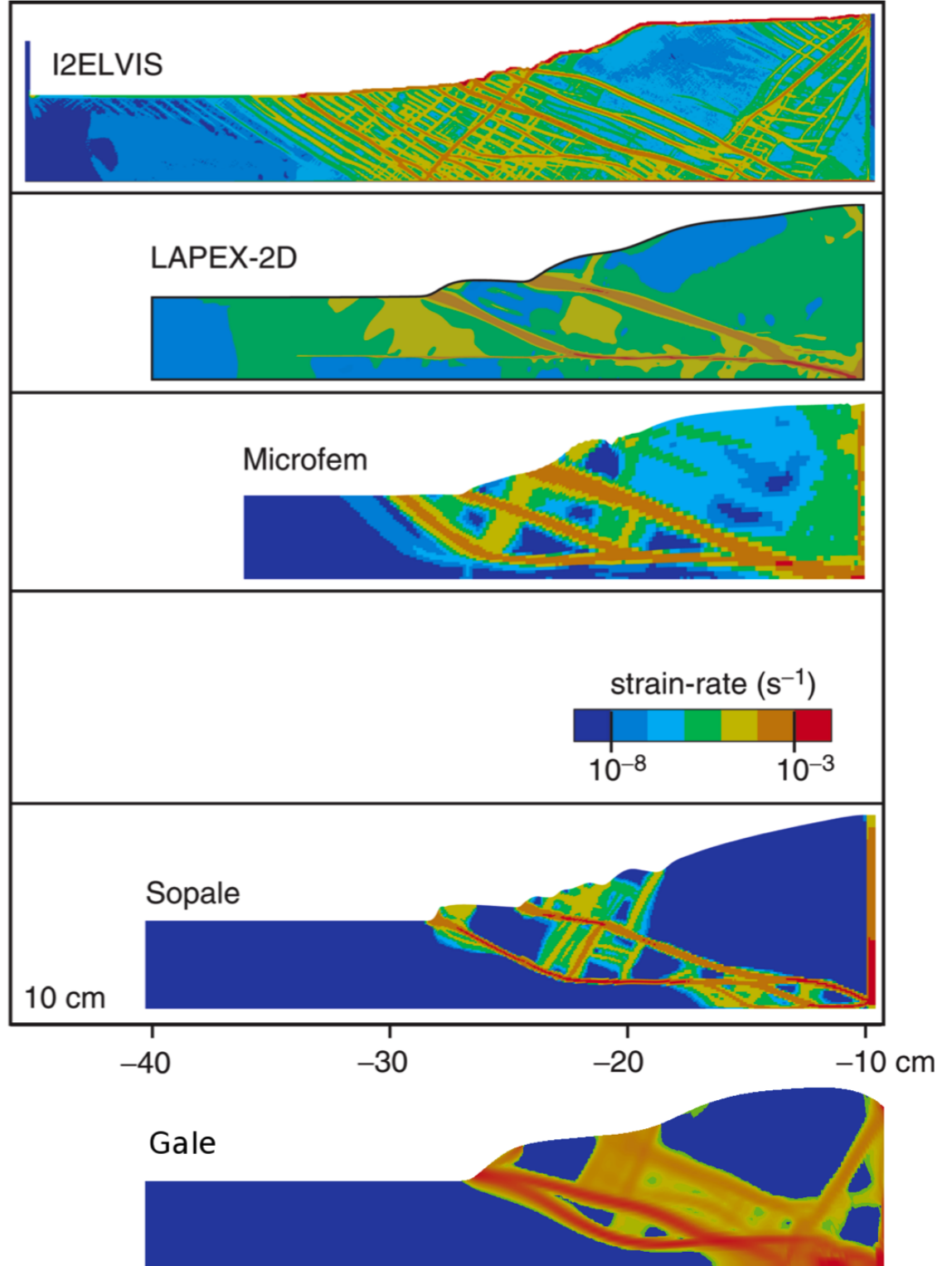
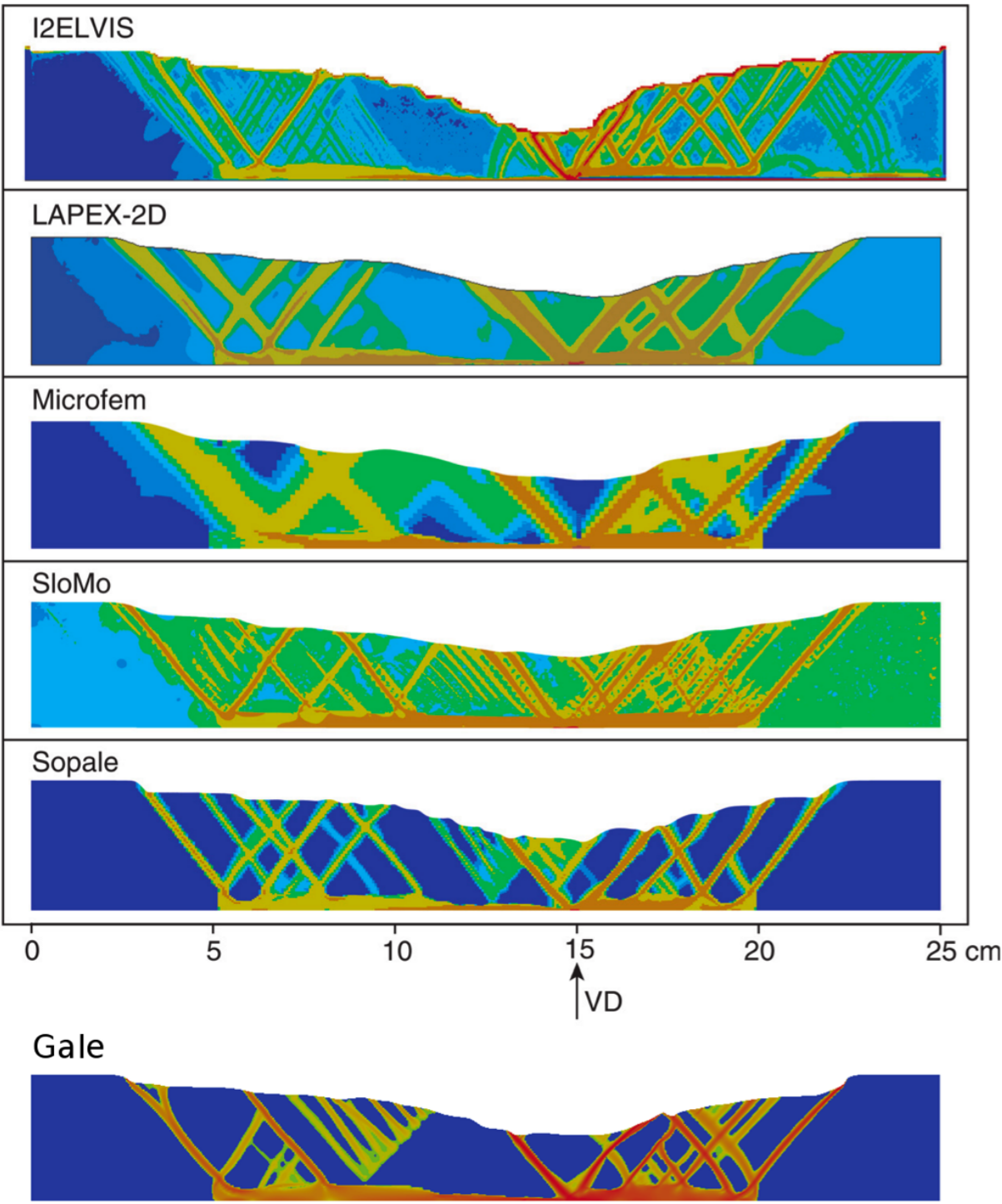
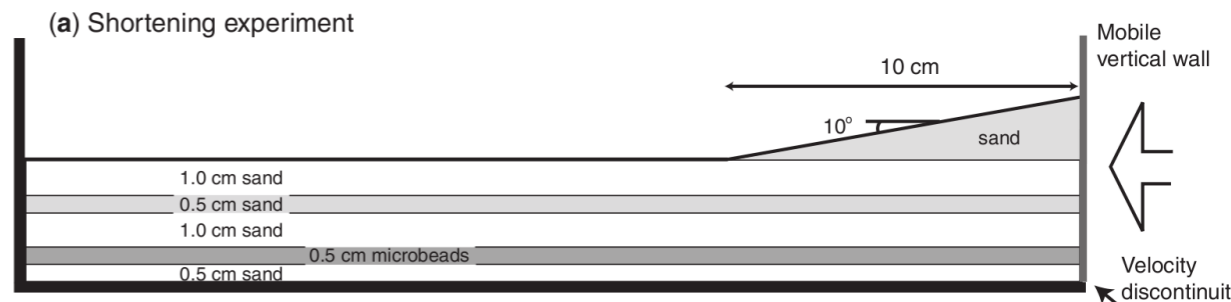
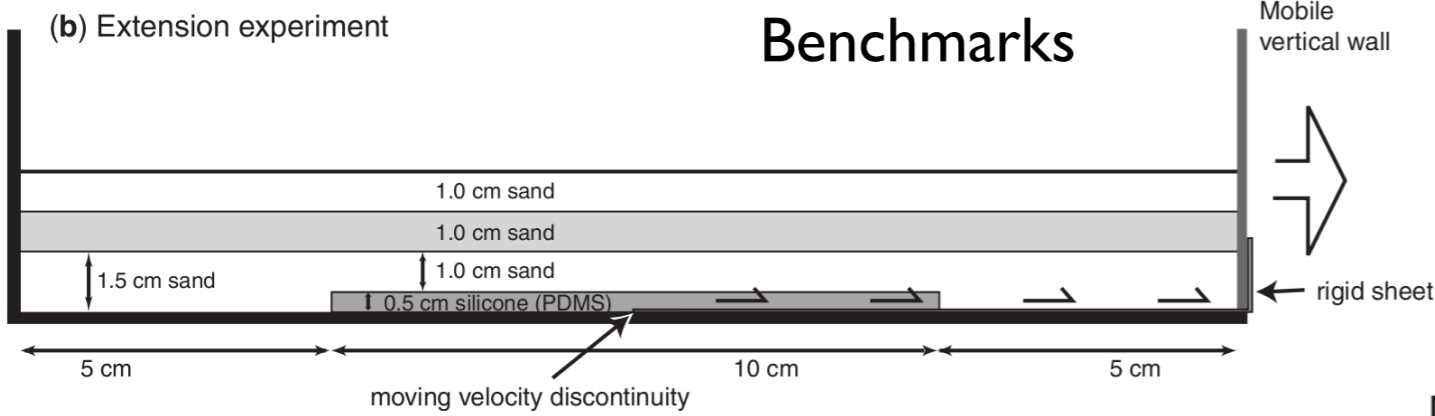
## **Technical issues and improvements of the current version of GALE:**

The consensus is that solving technical issues is the highest priority for CIG (and should take priority over adding new features.)

These priorities were / are  
(note: this list was as of April 3: these mostly now completed):

- Slow convergence of the UZAWA solver.
- Pressure oscillations.
- General way of setting boundary conditions, i.e., the ability to specify BC at nodes individually.
- Need to allow for irregular meshes
- Non-convergence when solving the GEOMOD2004 extension benchmark. The WG is trying to understand the reasons for this (may be solved already.)

# Benchmarks



# Documentation & Examples

- The WG is eager to see expanded/better documentation
- There is some interest in having GALE throw up easily understood warning flags when the model is outside of the appropriate parameter space.
- Examples of geologically realistic problems (the WG has a range of views on this topic)
  - One view is that this should be done by researchers (see following comment from Dennis)
  - Another view is that engaging CIG staff in developing such examples will make it easier for new users (especially students) to get into GALE and avoid problematic side-issues

## Sorting out the boundaries between research & infrastructure (and funding sources)

- From Dennis Harry:
- “here's a point that I would very much like CIG to consider. We need users invested in GALE that are spending substantial time (or having students spend substantial time) investigating the code behavior, documenting how to use the code, and working with CIG staff to solve the technical problems and add enhancements. But I don't see any NSF funding avenue to support this. I think we need to find a way to support researchers and grad students who are working to help CIG make the transition from software development and technical testing to a user-friendly research tool. Do other CIG WG's face this issue? How have they dealt with it?”

## **New features desired in GALE:**

- AMR
- Boundary conditions that vary along the sides (could be in process or implemented).
- P,T, and Z dependence of properties
- Coupling to surface processes.
- Coupling to CITCOM / calculation of mantle fabrics
- Prediction of melt (especially during extensional modeling).
  - Simple version: melt volume estimates
  - More fundamental: try to work with the other CIG groups that are tackling this
- Prediction of geobarometer and thermochronometer observables at the surface of GALE simulations. (May already be imbedded in GALE so just need a convenient way to extract it.)
- Simple dynamical simulation of faulting: slip between elements and/or nodes (slippery nodes.)