

NSF Site Visit to the Computational Infrastructure for Geodynamics

Long Term Crustal Dynamics

Walter Landry

CIG

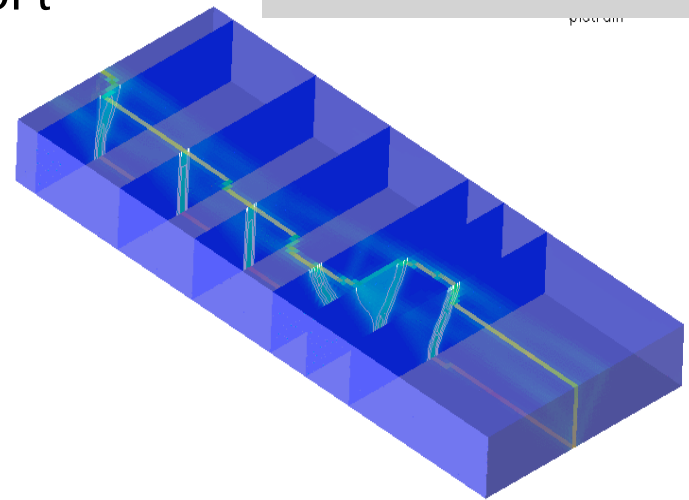
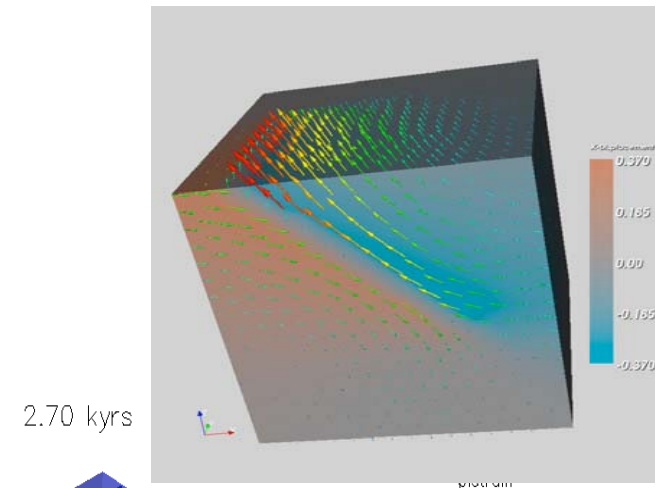


Workshop on Tectonic Modeling

- Co-sponsored by CIG and NSF
- Held in Breckenridge, CO June 9-12, 2005
- 26 participants
- Cataloged all of the various codes that the community uses and would like to see

Workshop on Tectonic Modeling

- Some of these codes are already in the pipeline
 - Pylith – An implicit Lagrangian code supported by CIG for short term crustal dynamics
 - SNAC – a new FLAC code that Eun-seo Choi is expected to donate to CIG in a year or so.



Workshop on Tectonic Modeling

- The main recommendation for CIG from that meeting was to find an existing 2D Arbitrary Lagrangian Eulerian code
 - release as is
 - make some improvements
 - integrate with Snark
 - eventually make a 3D AMR version
- They also wanted support for more benchmarking and workshops

Current CIG Work

- It took a while, but we got Sean Willett (UW) & Chris Fuller's (UW) Plasti code. We are still working with them to make a releasable version.
- In the meantime, we have forged ahead on a new ALE code: GALE

GALE

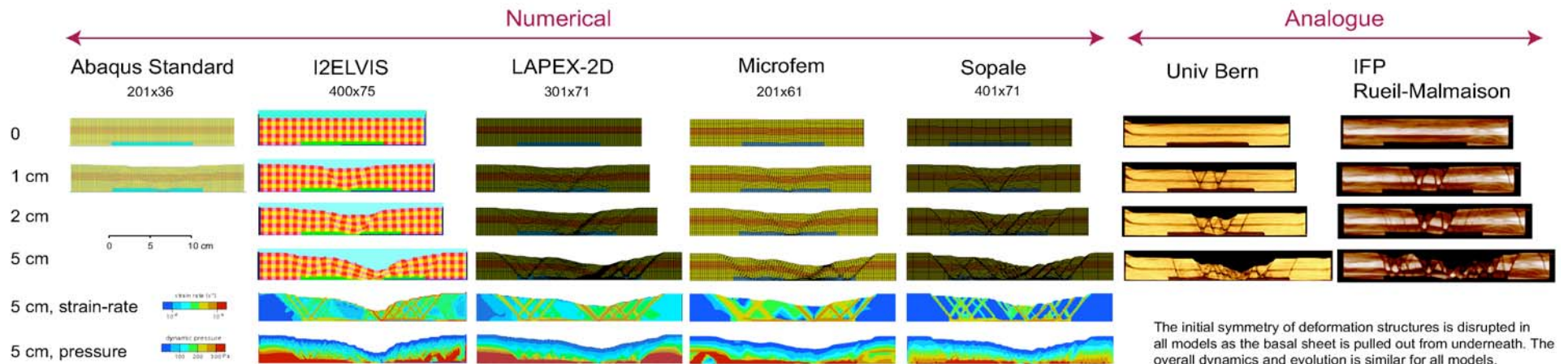
- We have to decided to base our efforts on St Germain, StgFEM, PiCellerator, and Underworld.
- These are proven, capable, open source FEM libraries written by the Victorian Partnership for Advanced Computing (VPAC) and Louis Moresi's group at Monash University.
- CIG has a good working relationship with VPAC and Louis Moresi, and members of CIG have collaborated with them in the past (e.g. SNAC).

GALE

- We all met in Australia last fall and produced a plan with timetables and benchmarks.
- We emailed the plan to the cig-long list and participants of the Breckenridge workshop.

GALE

- We worked with Susanne Buiter (NGU) to improve the benchmark specifications.



GALE

- Since then, Luke Hodkinson (VPAC) and I have been writing the code. Cassie Ferguson will assist us in writing documentation.
- We have recruited Roger Buck (Columbia), Robert Bialis (Columbia) and Chris Fuller (UW) from the community to guide us in making the code useful to geoscientists.

GALE

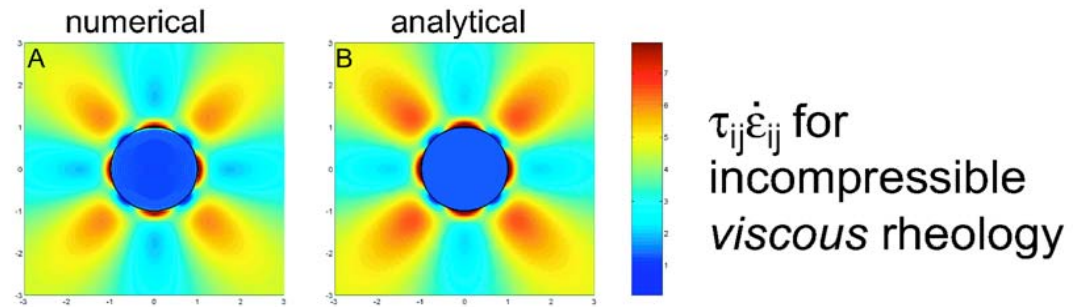
- Nov 20 - Write Rough Proposal, integrating the goals in the context of Fullsack (1995) (WL, MG, SQ)
- Develop XML Specs for GeoMOD plastic bench marks
- Set up a Plone page
- Establish repository with empty parts (WL, SQ)
- Demonstrate an extension model
- Complete the initial implementation of a moving upper boundary of the Eulerian mesh

GALE

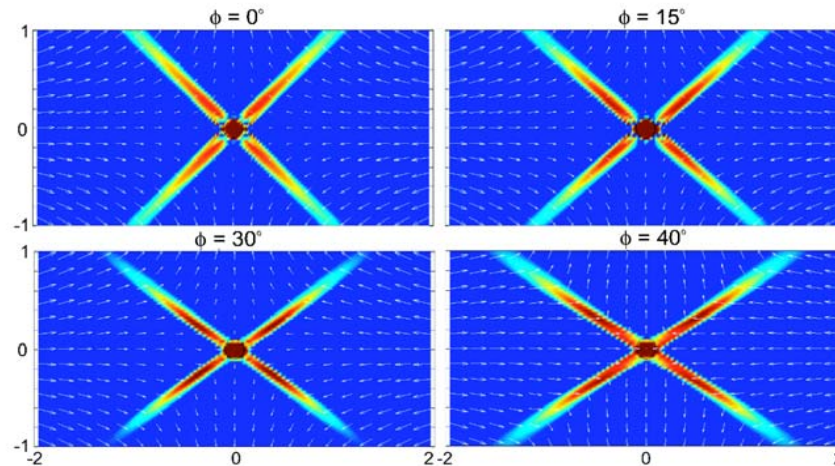
- Dec 15
 - Iterate on proposal by seeking input from community (WL)
- Jan 15
 - Demonstrate SOPALE workflow using GALE primarily based on StGermain components (WL, LH)
 - Parts will not be fully working
- Apr 15
 - Demonstrate complete simple benchmarks
- Oct 15
 - Run the complete SOPALE integration benchmark
 - Release GALE 1.0

Future Plans

- Work with Susanne Buiter on more benchmarks



visco-elasto-*plastic* inclusion experiment



2.2% compression, 101x256 resolution

Gango - Boris Kaus, PhD thesis, 2005

Future Plans

- Release Plasti
- Finish GALE
 - This will give us a 3D parallel code
 - But 3D means that we can't brute force solutions anymore
 - > Adaptive Mesh Refinement