



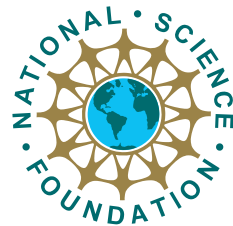
Computational Infrastructure for  
**Geodynamics**

# CIG: Software for the Geophysics Community

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CIG

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# CIG's Mission

- CIG's mission is to develop, support, and distribute software for the geoscience community.
- Our principle focus is on software for computationally challenging problems that require supercomputers.
- But why?

# Why CIG?

- For these problems, the software that geoscientists use is increasingly complicated. As they strive to investigate more complicated problems in greater detail, they can end up spending all of their time on computer science issues, and little on the physics.

# Why CIG?

- Conversely, there are already a number of codes out there that people could use, if only they were
  - Documented
  - Tested
  - Maintained

# How CIIG sets priorities

- CIIG's governing body is elected from representatives of affiliated institutions - new ones are free to join

Argonne National Laboratory (MSC)  
Brown University  
California Institute of Technology  
Colorado School of Mines  
Colorado State University  
Columbia University  
Cornell University  
Georgia Institute of Technology  
Harvard University  
Johns Hopkins University  
Lawrence Livermore National Laboratory  
Los Alamos National Laboratory (ES)  
Massachusetts Institute of Technology  
Oregon State University  
Pennsylvania State University

Princeton University  
Purdue University  
Rensselaer Polytechnic Institute  
State University of New York at Buffalo  
State University of New York at Stony Brook  
U.S. Geological Survey (Menlo Park)  
University of California, Berkeley  
University of California, Davis  
University of California, Los Angeles  
University of California San Diego  
University of Colorado  
University of Hawaii  
University of Maine  
University of Maryland  
University of Michigan

University of Minnesota  
University of Missouri–Columbia  
University of Nevada, Reno  
University of Oregon  
University of Southern California  
University of Texas at Austin  
University of Washington  
Washington University  
Woods Hole Oceanographic Institution  
Australian National University  
Monash University  
Geological Survey of Norway (NGU)  
University of Science and Technology of China  
University of Sydney  
Victorian Partnership for Advanced Computing

# How CIG sets priorities

- More importantly, CIG runs a number of workshops for different areas of geophysics. These workshops are the primary source of recommendations directly from the users.

2005 Mantle Convection Workshop: Boulder, CO, 2005/06/19  
Geodynamic Modeling of Tectonics Processes: Breckenridge, CO, 2005/06/10  
CIG/IRIS Workshop on Computational Seismology: Stevenson, WA, 2005/06/08  
Workshop on Community Finite Element Models for Fault Systems and Tectonic Studies:  
Los Alamos, NM, 2005/07/11  
CIG-MC Workshop West Lafayette, IN, 2006/03/27  
2006 Workshop on Community Finite Element Models for Fault Systems and Tectonic  
Studies: Golden, CO, 2006/06/26  
Mantle Dynamics Training - CIDER Workshop: Santa Barbara, CA, 2006/07/16  
Magma Migration Workshop: Columbia University, NY, 2006/08/01  
Studies of Earth's Deep Interior: Prague, Czech Republic, 2006/07/09  
Imaging Science and CIG Computational Seismology Workshop: 2006/09/21  
Scientific Computing Workshop: Austin, TX, 2006/10/16

# What exactly does CIG do?

- As little as possible
  - CIG **reduces** its workload by partnering with other institutions. Just organizing the community is a key focus of CIG.
  - CIG **reuses** existing software frameworks and libraries such as Pyre, Petsc, HDF5, and StGermain.
  - CIG **recycles** existing codes so that they become available to a wider audience.

# Develop, Support, Distribute

- Use modern software engineering techniques to create robust, tested, and documented codes.
  - Version Control  
`http://geodynamics.org/websvn`
  - Regression Testing  
`http://geodynamics.org/cig/software/buildbot`
  - Cross Platform Build Tools: Autoconf, Automake, BuildSystem, SCons
  - High Level Languages - Python



# Develop, **Support**, Distribute

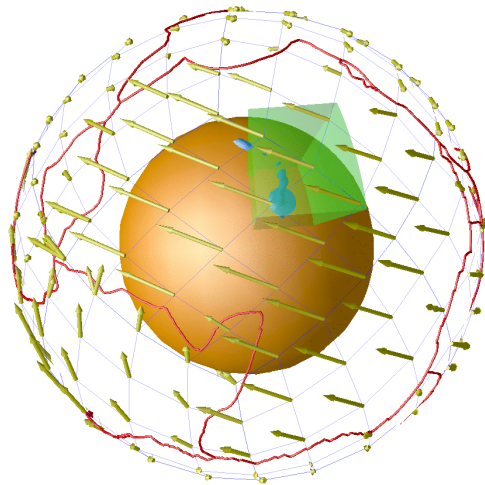
- All development is open to the public - No annoying registration just to see what is going on
  - Public, archived mailing lists  
`http://geodynamics.org/cig/lists`
  - Publicly accessible software repository
  - Bugtracker  
`http://geodynamics.org/roundup`
  - Documentation

## Develop, Support, **Distribute**

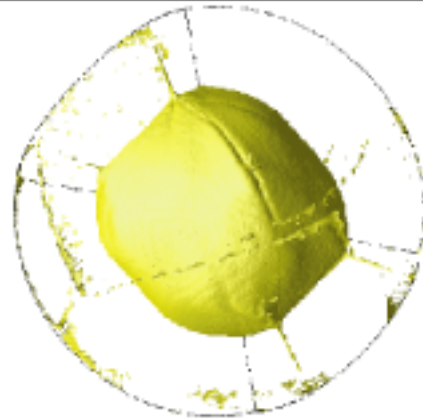
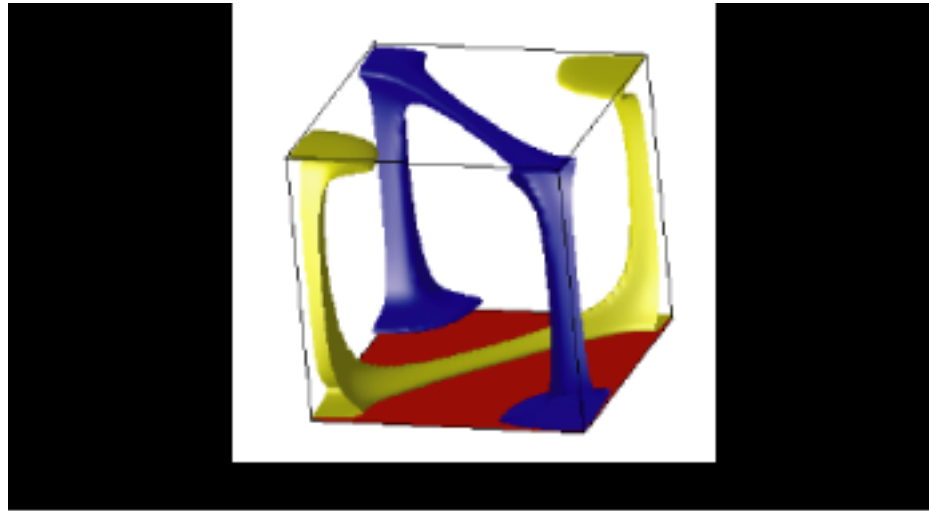
- Release of tested code
- Software repository is always accessible
- All code is free to use, modify and redistribute (make your own CIG!). No dependence on proprietary toolkits.

# What has CIIG done lately

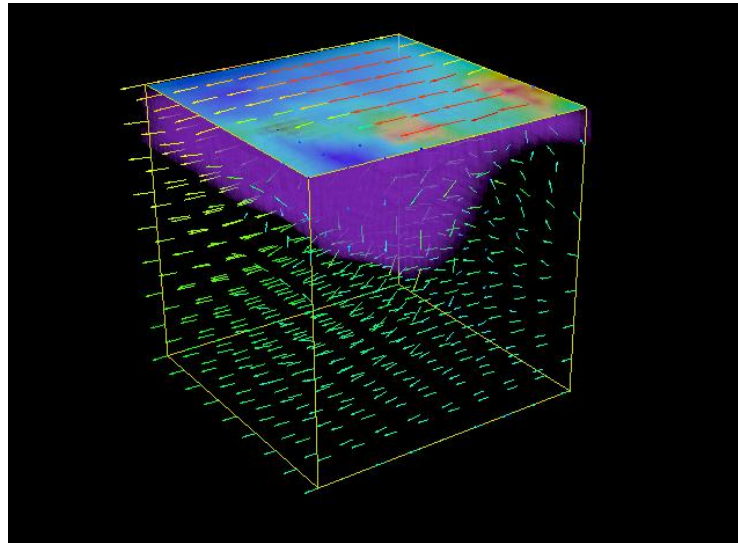
- Mantle Convection
  - CitcomS.py (**reuse**, **recycle**)



– CitcomCU (**recycle**)

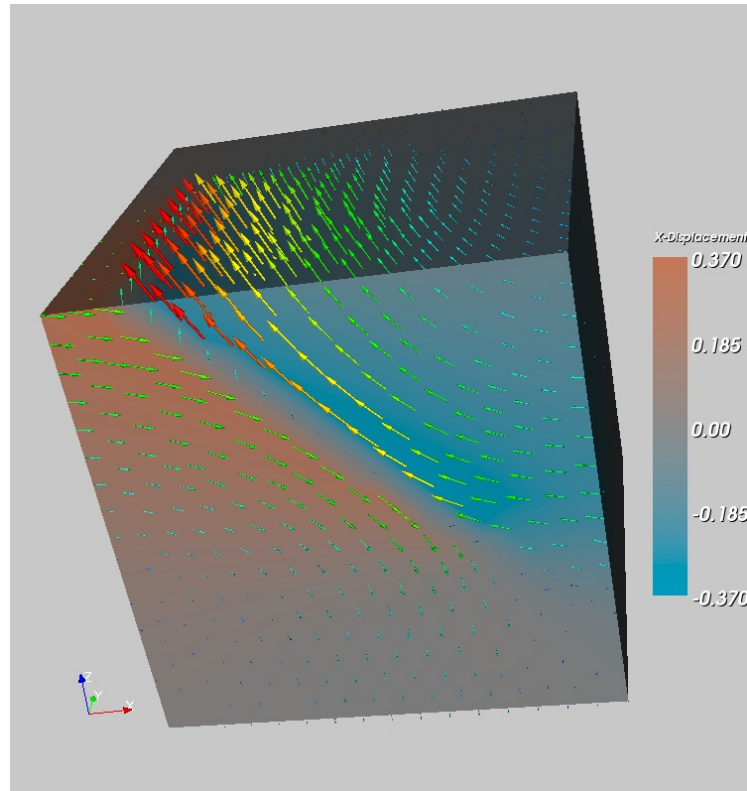


– Ellipsis3D (**recycle**)



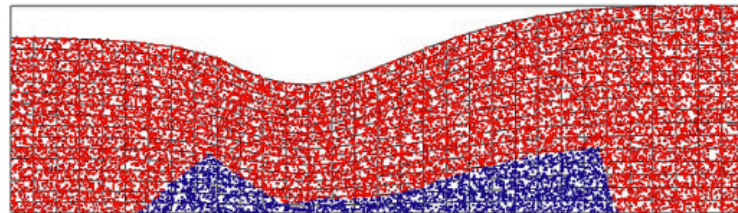
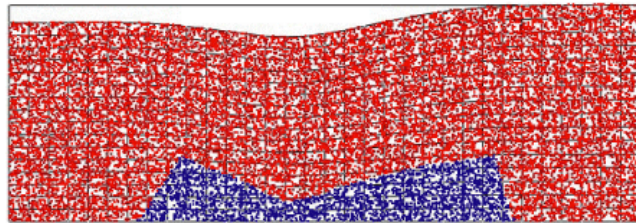
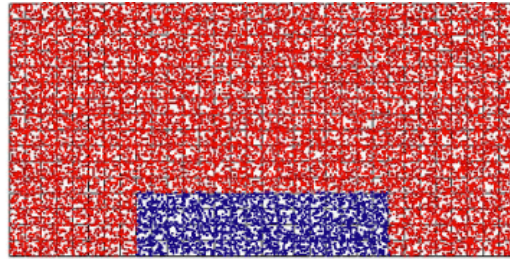
- Short Term Tectonics

- Lithomop (**reduce, reuse, recycle**)



- Long Term Tectonics

- Gale (**reduce, reuse**)



# What is CIIG working on

- Mantle Convection
  - Enhance CitcomS and CitcomCU to use standard data formats (HDF5)
  - Compressible codes
    - \* Eh Tan will start soon, and he will concentrate on that
    - \* CIIG is providing infrastructure for Craig O'Neill and Thorsten Becker
    - \* Get and release Conman

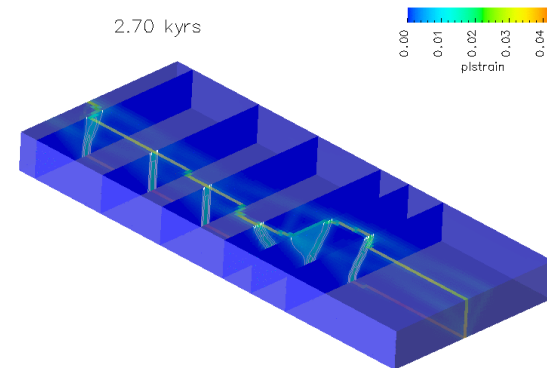


- Short Term Tectonics

- Merge the capabilities of Lithomop and EqSim into PyLith.

- Long Term Tectonics

- Continue Gale development
- Release Plasti
- Get and release Snac



- Seismology

- Help with Specfem development

- Release Minos-Bran

- Geodynamo

- We are in the process of hiring someone to concentrate on this

- get and release MAG and MAGIC

<http://geodynamics.org>

