

## 2013-2018 Work Plan

### Short-Term Tectonics Priorities

Short-Term Tectonics Working Group priorities for Mar 2013 – Jan 2018.

#### Immediate, Urgent goals

##### SOFTWARE DEVELOPMENT

- PyLith development (For more details see PyLith Development Plans)
- Establish interaction with computational seismology group on meshing issues (e.g., keep up-to-date on the development of Geo-CUBIT).

##### COMMUNITY ACTIVITIES

- Provide training via virtual workshops  
We have another virtual workshop scheduled for June 2013. It will coincide with the release of PyLith 2.0 and will focus on intermediate and advanced topics. We solicit ideas from users on additional online training.

Continue development of a PyLith wiki to complement the cig-short email list and PyLith manual  
Continue series of in-person workshops on biannual basis (even years)

#### Key goals

##### SOFTWARE DEVELOPMENT

Develop a common framework for geodetic, seismic, and combined inversions.  
Develop inversion plug-ins for various inversion methods, including Bayesian approaches.  
**Identify a scientist to lead this effort.** Responsibilities would involve getting funding, assembling a development team (which might include a CIG developer), and overseeing software development.

##### Research

Develop a fully constrained and internally consistent physics for the entire seismic cycle  
Simulate the entire seismic cycle in simulations that capture interseismic deformation, rupture nucleation and  
and postseismic deformation with realistic Earth models (geometrical complexity, material heterogeneity,  
rheologies). Constraints on fault and bulk rheologies that are consistent with extensive geodetic, seismic,  
and observations are critical to understanding the behavior of fault systems and improving the accuracy and  
of earthquake hazard assessments.

trained and internally consistent physics for tectonics of magmatic systems, geothermal systems, and tectonic processes with heat and fluid flow, thereby enabling complex rheologies with temperature dependence. Inclusion of fluid flow into tectonic modeling significantly expands the range of problems that can be addressed (e.g., in geothermal areas) and permits direct application of additional geophysical constraints. Viscoelastic, viscoplastic rheologies are important for bridging between seismic and tectonic time scales. Coupled modeling of crustal deformation associated with surface loads and fluid flow. Coupling of rheologies of the crust using geodetic and geologic observations of deformation arising from glacial unloading, rebounding, and other surface loads.

## Computational Techniques

Implications of using currently available and emerging computational techniques for earthquake simulation. Addressing undesirable limitations on the geometry of the domain (e.g., topography) and faults or may introduce

(e.g., deal.ii and p4est)

Resolution of small length scale features through local refinement and coarsening of the mesh.

Quantification of the uncertainty in parameters based on observations.

Simulation of specific problems using high-level tools

Resolution of dislocations and material boundaries within a structured grid. This would permit a structured approach to modeling of faults and interfaces.

Multi-scale homogenization. Resolution of multiple time scales through slow/fast timescale coupling.

Workflow of the various stages of modeling (creating the geologic model, meshing the domain, simulating the

urrent software.

e to new users but also provides the flexibility and extensibility required by expert users.  
codes  
eatures to community codes in order to solve specific research problems.

rt modeling codes and tools.

arth science developers and vice versa. This could be implemented via some form of travel grants for in-

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