

2009-2015 Work Plan

Short-Term Tectonics Priorities

Short-Term Tectonics Working Group priorities for Apr 2009 – Jan 2015.

Immediate, Urgent goals

- PyLith development (For more details see PyLith Development Plans)
 - Accelerate development via a postdoc
 - Nonlinear rheologies
 - Fault friction via cohesive cells
 - Large deformations

semi-analytic codes (layered elastic and viscoelastic, internal and surface loads) under version control. Documentation as necessary and provide portability via a standard build procedure. Establish interaction with computational seismology group on meshing issues (e.g., keep up-to-date on the development of Geo-CUBIT).

Goals

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

Highly constrained and internally consistent physics for tectonics of magmatic systems, geothermal systems, and hydrothermal systems.

Integrate tectonic processes with heat and fluid flow, thereby enabling complex rheologies with temperature-dependent properties. Incorporating heat and fluid flow into tectonic modeling significantly expands the range of problems that can be modeled and permits direct application of additional geophysical constraints. Viscoelastic, elastoplastic, and poroelastic models are important for bridging between seismic and tectonic time scales.

Modeling of crustal deformation associated with surface loads

Validation of the crust using geodetic and geologic observations of deformation arising from glacial rebound, isostatic rebound, and other surface loads.

Techniques

ions of using currently available and emerging computational techniques for earthquake modeling.
ns on the geometry of the domain (e.g., topography) and faults or may introduce severe ill-conditioning

l.ii and p4est)

th scale features through local refinement and coarsening of the mesh.

ertainty in parameters based on observations.

blems using high-level tools

n of dislocations and material boundaries within a structured grid. This would permit a structured mesh

enization. Resolution of multiple time scales through slow/fast timescale coupling.

e inputs and outputs of the various stages of modeling (creating the geologic model, meshing the

oftware.

users but also provides the flexibility and extensibility required by expert users.

provide funding for expert users to work with code developers to add new features to community codes in

ling codes and tools.

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

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