

## Benchmarks - OLD

### Community Finite Element Models for Fault Systems and Tectonics Studies Benchmarks

Benchmark descriptions for the Working Group for the Development of Community Finite Element Models for Fault Systems and Tectonics Studies

#### Overview of Goals and Objectives

Goals and objectives, general methodology for the Working Group for the Development of Community Finite Element Models for Fault Systems and Tectonics Studies

#### Benchmark 1

Viscoelastic relaxation of stresses resulting from an imposed uniaxial strain. No body forces are imposed. Material should have infinite bulk viscosity (i.e., should not relax in volume, only in shear).

#### Benchmark 2

Various tests on the implementation of gravity in viscoelastic finite element models. All analyses are 2D plane strain and assume uniaxial strain boundary conditions.

#### Benchmark 3

Viscoelastic relaxation of stresses resulting from an imposed simple shear strain. No body forces are imposed.

#### Benchmark 4

Viscoelastic (Maxwell) relaxation of stresses from a single, finite, strike-slip earthquake.

#### Benchmark 5

Viscoelastic (Maxwell) relaxation of stresses from a single, finite, dip-slip earthquake in 3D without body forces. The analytical solution for the elastic displacement (available at [geoweb.mit.edu/fe/](http://geoweb.mit.edu/fe/)) is applied at the boundaries and held fixed through time.

#### Benchmark 6

Viscoelastic (Maxwell) relaxation of stresses from a single, finite, dip-slip earthquake in 3D with body forces.

#### Benchmark 7

Elastic solution for a circular strike-slip fault. The conceptual model is an elastic disk of radius 200 km, with a circular left-lateral strike-slip fault forming an inner plug which rotates inside the outer annulus. Because of the symmetry of the problem, radial displacements should vanish and only the first quadrant needs to be modeled. If required, a mesh using cylindrical coordinates can be downloaded from <http://geoweb.mit.edu/fe/>.

### Community Block Model

## LaGrit Examples

#### Example 1

Intersect Two 3D Tet Meshes, Refine Volume of Intersection, Remove Intersecting Tets

### [Example 2](#)

Hexahedra to 5, 6 or 24 Tetrahedra

### [Example 3](#)

Intersect Two Surfaces, Make Hole in Surface Defined by Intersection

### [Example 4](#)

Intersect Two Surfaces, Extract Line Object Defined by Surface Intersections

### [Example 5](#)

Triangulate a Polygon, Use refine, smooth to Change Mesh Size and Quality

### [Example 6](#)

Compute Median Point of Tri, Quad, Hex, Tet and Color By Median Value

### [Example 7](#)

Triangulate Multiple Polygons and Modify Triangle Size With massage to Refine, Derefine and Smooth.

### [Example 8](#)

Create a Triangulation With a Degenerate Internal Edge Which Creates a Non-Matching Triangulation

### [Example 9](#)

Connect a Tet Mesh to a Hex Mesh Using Pyramid Elements

### [Example 10](#)

Use PSETS and set  $Z(x,y)$  Surface To  $\text{Max}(Z(x,y))$  of Two Surfaces