Crustal Deformation Modeling Tutorial

Meshing with Basic Two-Dimensional Geometry

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June 10, 2019

Meshing with Basic Two-Dimensional Geometry

Steps in creating a mesh

- Determine geometric features needed
  - Fault geometry
  - Topography
  - Sharp structural boundaries
  - Magma sources with complex geometry
- Create spline curve (2D) or NURBS surface (3D) in CUBIT/Trelis
- If using surface in several models export it for future use
- Use surfaces within CUBIT/Trelis to webcut or split volumes/surfaces
- Choose discretization according to type of problem

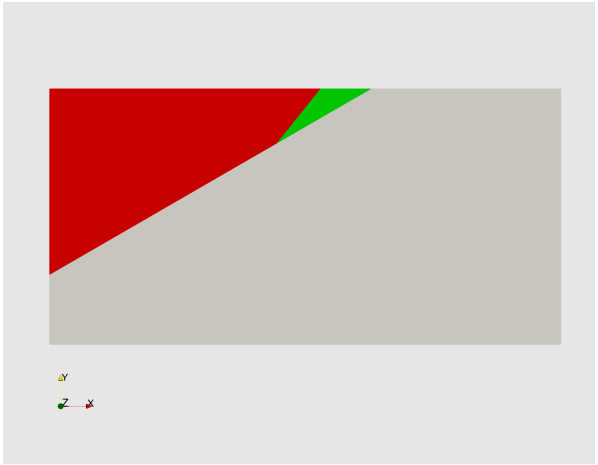
Meshing of a thrust fault with splay

2-D coarse meshing of a planar thrust fault with a simulated splay fault

- Two-dimensional reverse fault example `examples/2d/reverse`
  - All other journal files are called from either `mesh_tri.jou` or `mesh_quad_tri.jou` using Cubit or Trelis.
    - Generate basic geometry using `geometry.jou`.
    - Define mesh sizing information using `gradient.jou`
    - Define blocks and boundaries using `createbc.jou`

Meshing of a thrust fault with splay

Geometry with thrust (extended) and splay fault



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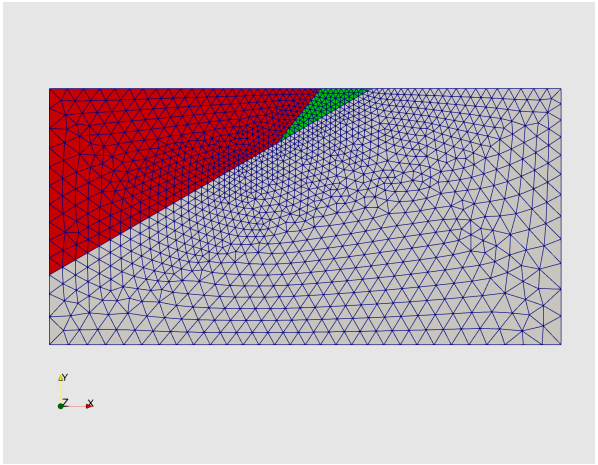
Triangular mesh generated for 2-D reverse fault example

Graded mesh with approximately 2.7k cells



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What's missing

Additional modifications for real problems

- Mesh needs to be larger to move boundaries away from region of interest. One option would be to enclose this mesh in a larger box.
- The mesh is too coarse.
- Structural features such as the crust and slab could be added.
- Real faults are more likely to be curved than planar.

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