What's New In PyLith 1.5.0?

Charles Williams, Brad Aagaard,
Matthew Knepley, Surendra Somala,
Sue Kientz, and Leif Strand


Computational Infrastructure for Geodynamics

June 15, 2010

Time Integration and Formulations

- Quasi-static problems.
  - Finite strain (large rigid body displacements but moderate strain).
- Dynamic problems.
  - Infinitesimal strains with lumped system Jacobian.
  - Finite strains with sparse system Jacobian.

Computational Infrastructure for **Geodynamics**

Finite Strain vs. Infinitesimal Strain Comparison
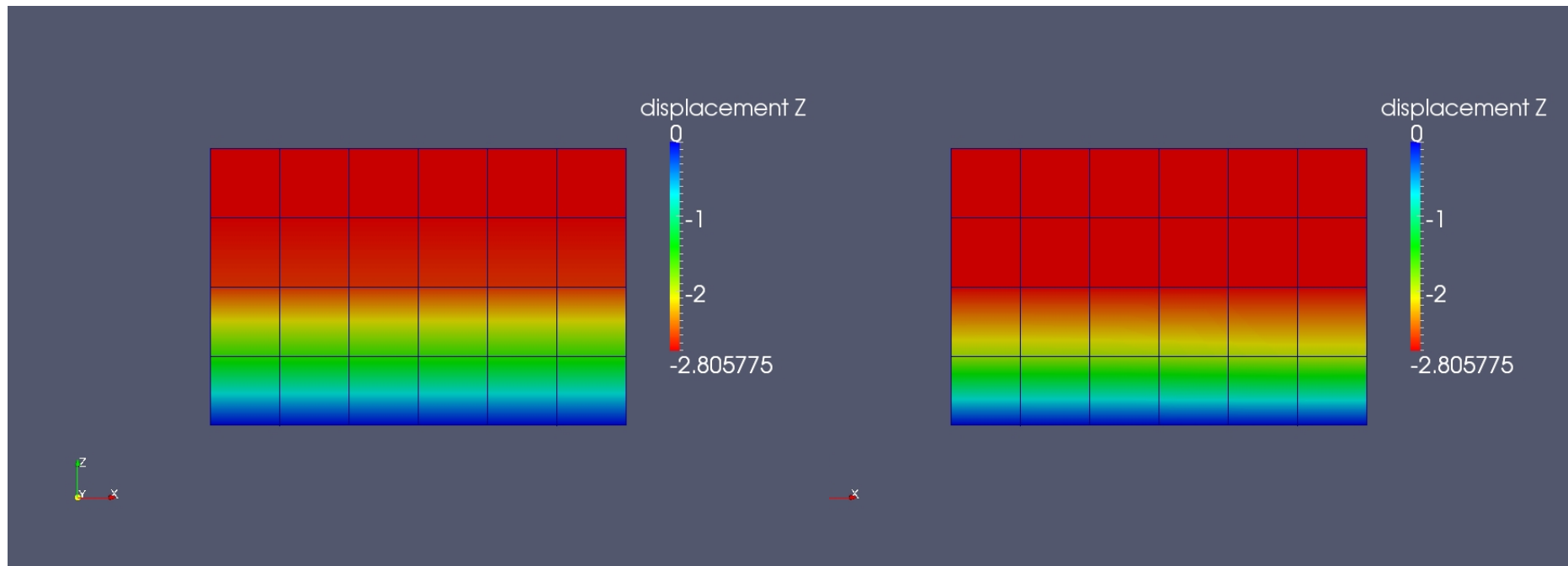
Infinitesimal strain
Step15 example

Finite strain
Step17 example

Computational Infrastructure for
Geodynamics

Bulk Constitutive Models

- Linear Maxwell viscoelastic model (2D plane strain).

- Drucker-Prager non-associated elastoplastic (3D).

Dynamic (Friction) Fault Interfaces

- Constitutive models:
  - Static friction (static friction coefficient plus cohesion).
  - Linear slip-weakening friction.
  - Dieterich-Ruina rate-and-state friction with aging law.

Computational Infrastructure for **Geodynamics**

Static Friction Test
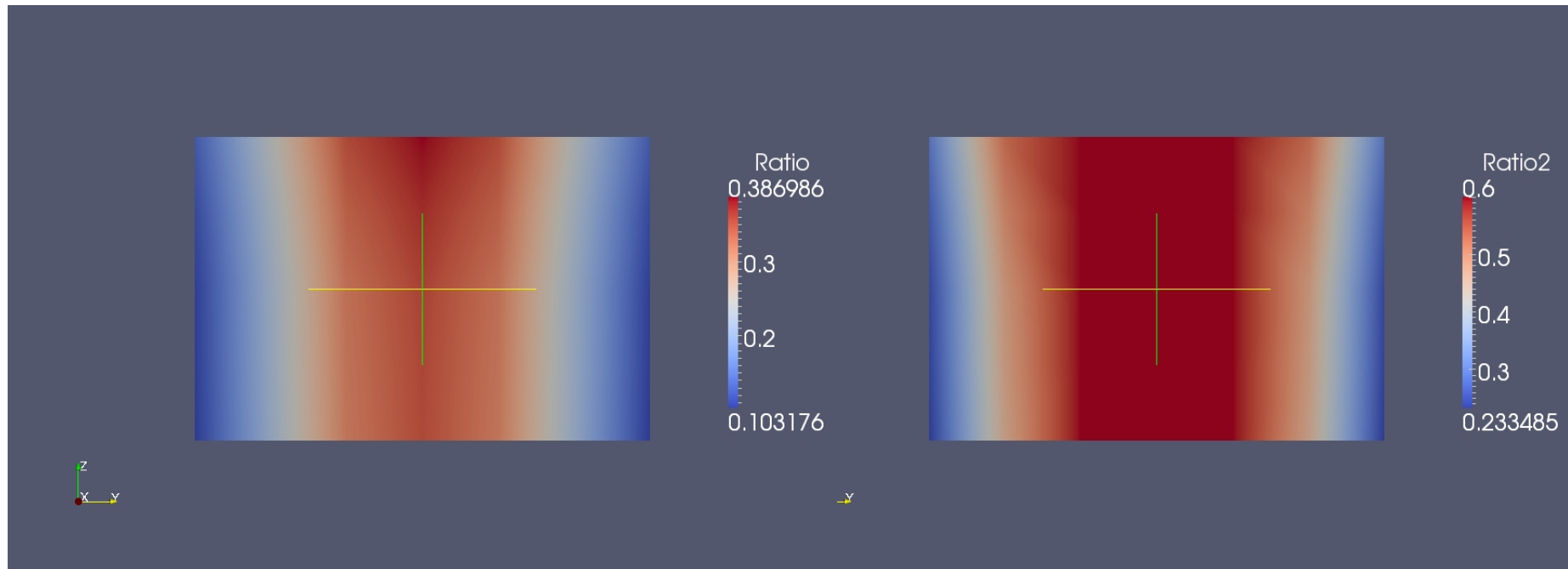
Stuck fault
Step10 example

Slipping fault
Step11 example

Documentation

- Completely reworked tutorials.
  - Many more examples.
  - Demonstration of new code features.
- Improved section on governing equations.
- Comprehensive description of fault implementation, including new fault friction constitutive models.

Computational Infrastructure for
Geodynamics

Additional Improvements

- Bug fixes.
- Optimizations.
  - Optimized for particular element type/quadrature combinations.
  - Improved preconditioners.
- Additional improvements (e.g. output of velocity field for quasi-static problems.