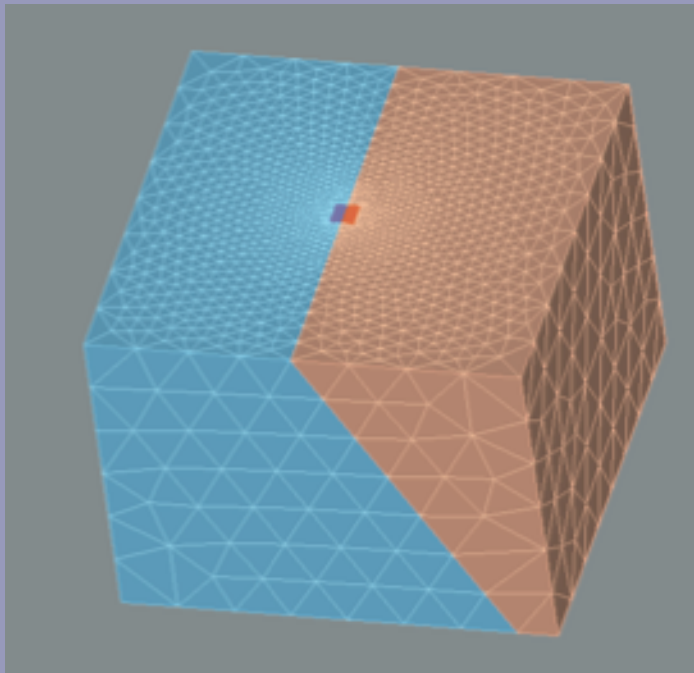


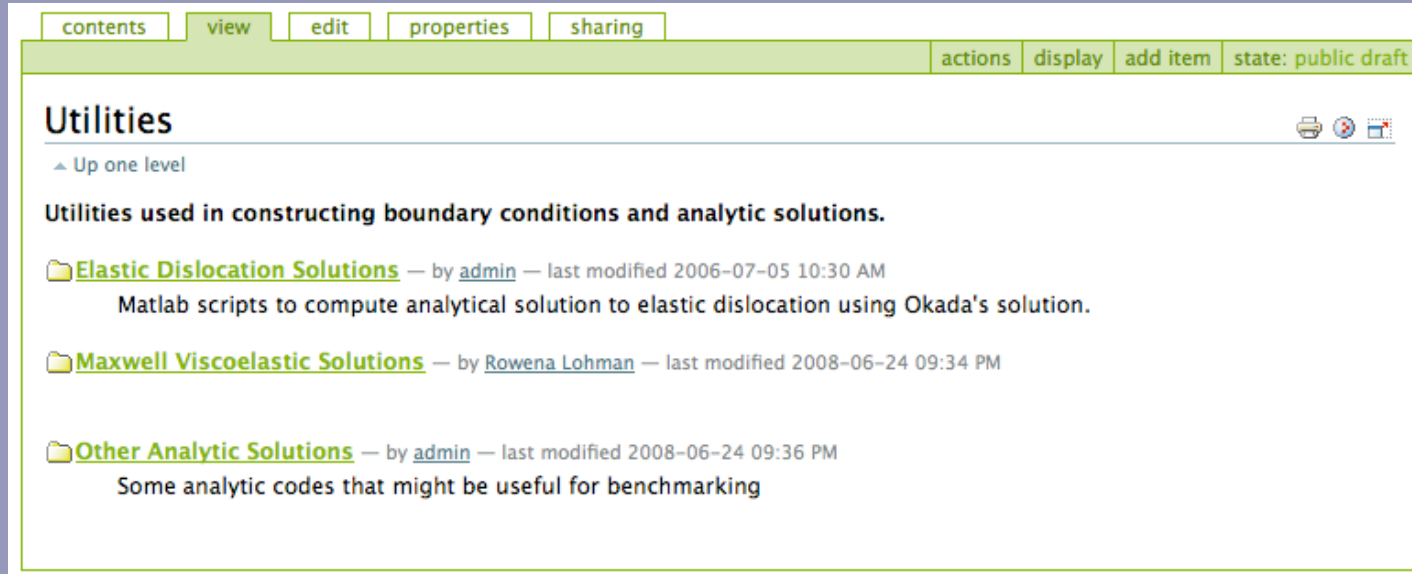
Report on semi-analytic code compilation effort



June 23-27 Workshop on
Numerical Modeling of
Crustal Deformation and
Earthquake Faulting

Intro/Links

- Location: work area -> benchmarks -> utilities



The screenshot shows a web interface with a navigation bar at the top containing buttons: 'contents', 'view', 'edit', 'properties', 'sharing', 'actions', 'display', 'add item', and 'state: public draft'. Below the navigation bar, the main heading is 'Utilities' with a link '▲ Up one level' and three icons (print, refresh, and a flag). The content area lists three utility folders:

- Elastic Dislocation Solutions** — by [admin](#) — last modified 2006-07-05 10:30 AM
Matlab scripts to compute analytical solution to elastic dislocation using Okada's solution.
- Maxwell Viscoelastic Solutions** — by [Rowena Lohman](#) — last modified 2008-06-24 09:34 PM
- Other Analytic Solutions** — by [admin](#) — last modified 2008-06-24 09:36 PM
Some analytic codes that might be useful for benchmarking

- Last year:
 - Rob Mellors volunteered to lead effort, add material to web page
- This year:
 - Decide whether and how to continue

Goals for this effort

- Community-wide
 - Lower threshold for use of Pylith and related codes
- Developer
 - Wider range of analytic and semi-analytic benchmark possibilities
- Future
 - Optimized codes through CIG?

Current Status: Summary

- Elastic Codes
 - Okada-based Matlab scripts
 - Propagator matrix layered models
 - Fast Fourier methods for vertical faults
- Maxwell Viscoelastic codes
 - Fast Fourier methods for vertical faults
 - Savage-Prescott

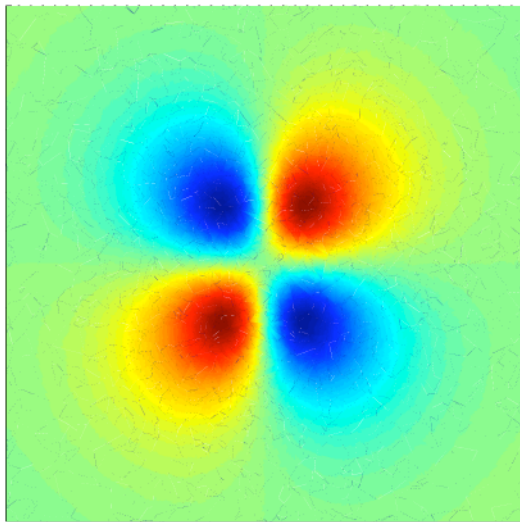
Elastic Codes

- On web page, some are files, others are links
 - Okada 1992 (Noah Fay)
 - Okada 1992 (Shinji Toda)
 - Triangular Dislocations (Meade)
 - Layered Elastic Models (Kaj Johnson)
 - Dislocation and Mogi Sources
 - Uses propagator matrix method
 - Fourier Elastic Half-Space Model (Smith & Sandwell)
 - Requires vertical fault, but computationally efficient

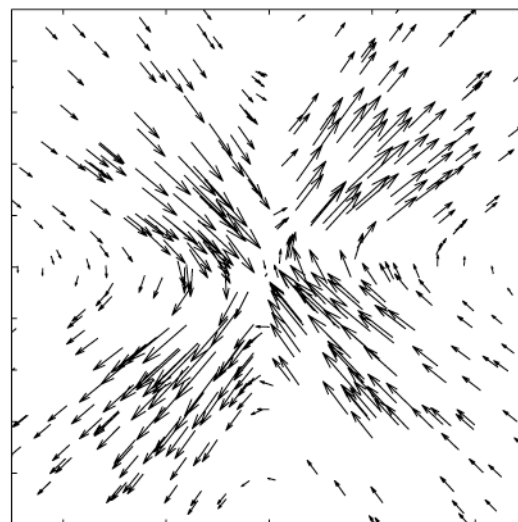
Quick benchmarks

- Okada, Meade, Johnson codes all compare well with Pylith for vertical strike-slip rectangular dislocation in half space
- Still need to format Smith & Sandwell routines for xy output

Vertical



Horizontal



Quick benchmarks

- Okada, Meade, Johnson codes all compare well with Pylith for vertical strike-slip rectangular dislocation in half space
- Still need to format Smith & Sandwell routines for xy output

Matlab driver (strike,dip,depth, etc)

Johnson_driver

Meade_driver

Okada_driver

Plot all comparisons

Viscoelastic Codes

- Smith & Sandwell
 - From Bridget Smith's PhD and Smith & Sandwell, 2006
 - Fast enough to perform 1000-year long simulations with multiple earthquakes
 - Still requires vertical fault and uniform properties in elastic and viscoelastic spaces?
- Kaj Johnson
 - Finite fault dislocation embedded within elastic layer overlying viscoelastic halfspace (Savage-Prescott)
 - Should compare well with the tests that Williams/Aagaard just put together

Future Needs

- Community input - who is being served?
 - Developer-level:
 - Preparing codes/examples is good exercise and reality check
 - Newcomers to CFEM:
 - How to find best analogue for your specific problem
 - What are our capabilities?
- Problems:
 - Input decks vary widely, some have no documentation
 - Chicken & Egg
 - Motivation to fix this is low unless community requests it
 - Newcomers won't request things they don't know are possible.

Future Needs: Initial List

- Agreement on importance of this archive
- Scripts/examples
 - Uniform driver codes for simple problems?
 - Apples-apples comparisons with Pylith
 - Green's function in Pylith
 - Scripts for people to generate their own?
- New analytical types
 - Radial coordinates
 - Larger events, subduction zones, interseismic
 - Burger's bodies, power-law, etc.
- ?

Known codes to add/request

- Email rolohman@gmail.com with suggestions
 - Poly3D - multiple-sided polygonal dislocations
 - visco1D?
 - Wang et al (comparison to visco1d + rundle et al...)
 - Alpha list & beta list