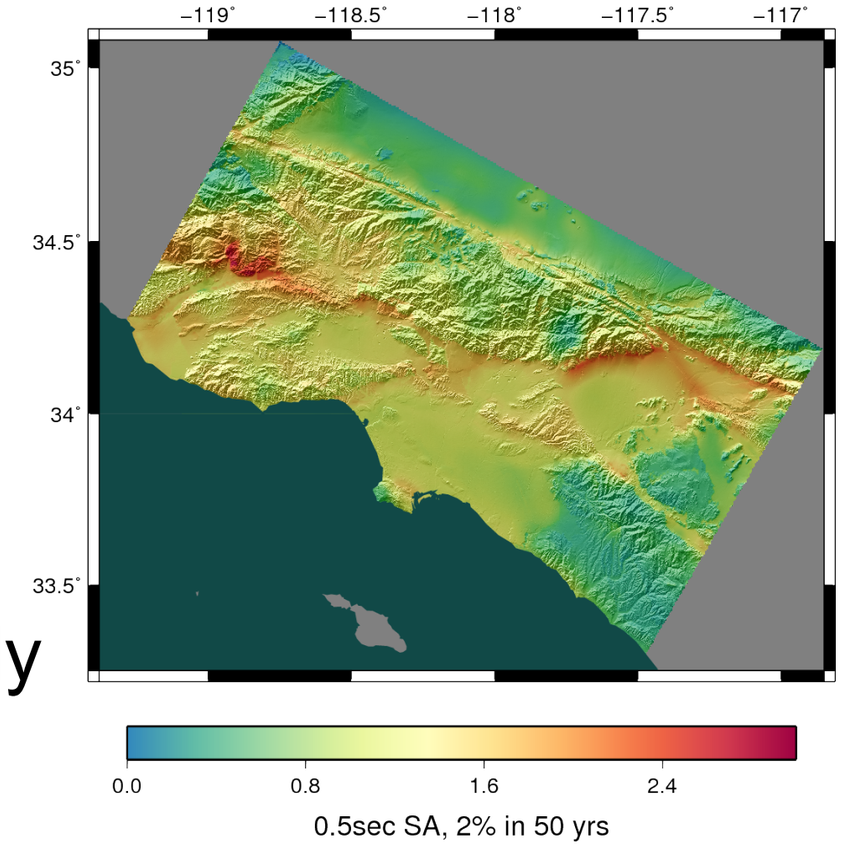
Future CyberShake Directions

Scott Callaghan

SCEC Research Computing Workshop
July 29, 2019

Software Updates for CyberShake

- Graves & Pitarka rupture generator
  - Update to BBP version, little change in computational cost
- AWP-ODC discontinuous mesh (DM) code
  - Testing suggests modest performance improvements
- Alternative ERFs to UCERF2
  - RSQSim (currently cheaper)
  - UCERF 3 (or 4?) (up to 20x cost)
- Include stochastic high frequency in every study
  - 4x increase in data requirements



Nonlinearity

- Reciprocity is by definition linear
- To support nonlinearity:
  - Pseudo-nonlinear approximations in kinematic source descriptions
  - Additional post-processing could approximate nonlinear crustal effects
  - Select subset of events for forward simulations (90/10 rule)

Percentage as forward simulations	Number of events	Increase in computational cost
3%	6,700	250%
5%	11,200	416%
10%	22,400	833%
50%	111,700	4164%

Data Management

- To date, CyberShake studies have produced:
  - 225 billion intensity measures (0.8 TB)
  - 2 billion two-component seismograms (89 TB)
- Of that data, 15 million IMs (0.07%) are available without emailing me
- A solution to enable interested users to access CyberShake data easily would make CyberShake more valuable to the community
- Data is already stored on SCEC servers; needs to be catalogued and delivered

Containerized CyberShake

- The current CyberShake codebase includes:
  - 16 computational steps
  - 20 executables
  - 5 external user-installed libraries
- Difficult to deploy on new systems
- A containerized version would support easy deployment
  - Could grow the community of direct CyberShake users
  - Would support continuous integration testing