Future CyberShake Directions

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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)

<table>
<thead>
<tr>
<th>Percentage as forward simulations</th>
<th>Number of events</th>
<th>Increase in computational cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>6,700</td>
<td>250%</td>
</tr>
<tr>
<td>5%</td>
<td>11,200</td>
<td>416%</td>
</tr>
<tr>
<td>10%</td>
<td>22,400</td>
<td>833%</td>
</tr>
<tr>
<td>50%</td>
<td>111,700</td>
<td>4164%</td>
</tr>
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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