CyberShake Study 24.8 Overview

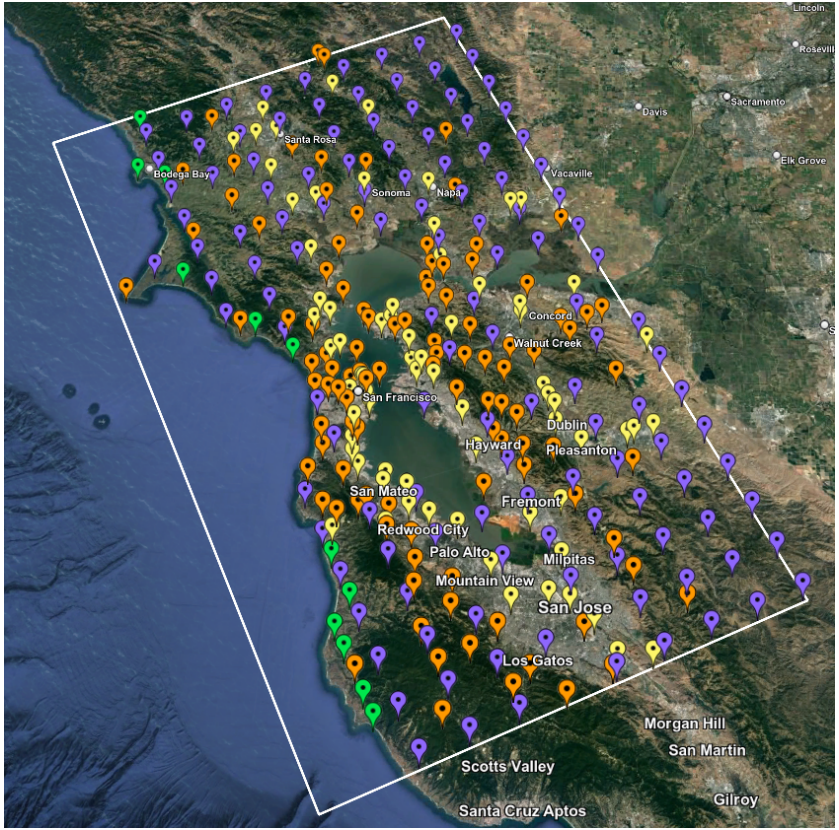
Scott Callaghan

September 18, 2024

Study 24.8 Scientific Goals

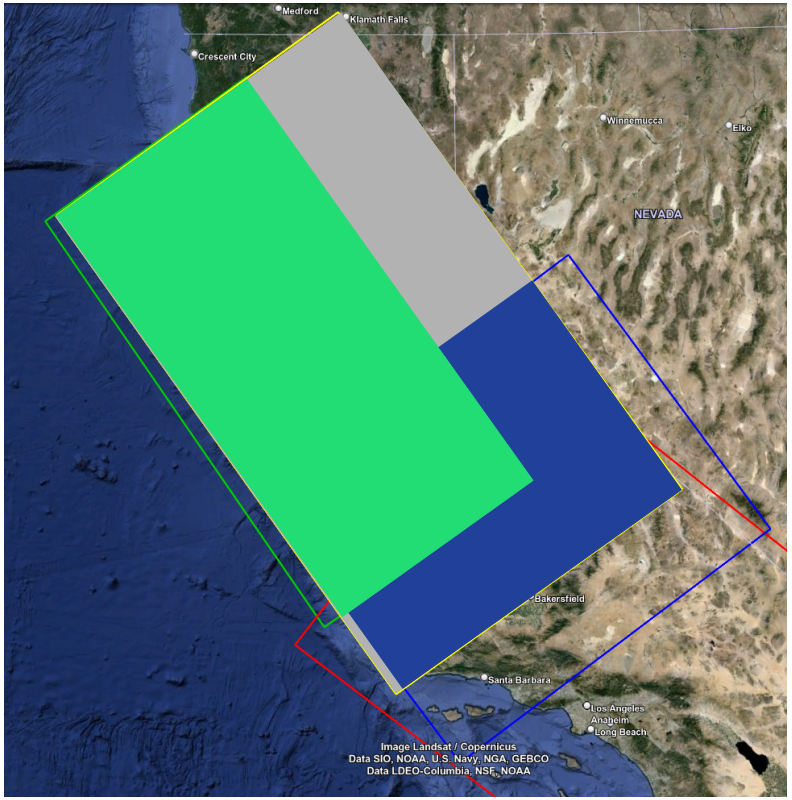
- Calculate the first broadband CyberShake study in the greater San Francisco Bay Area.
- Update the regional velocity model.
- Use the same rupture generator as in Study 22.12 in Southern CA.
- Remove southern SAF events from ERF.
- Calculate new data products.

Study Specs



- Greater Bay Area region selected
  - 100 km x 180 km box
  - 315 sites
- Deterministic simulation to 1 Hz
- Broadband to 50 Hz using GP high-frequency module from SCEC Broadband Platform
- Minimum Vs = 400 m/s
- Started with 20 sites as stress test (completed)

Velocity Model



Simulation volume for s3446, the largest in the study

- Model consists of 3 tiled models
  - USGS SFCVM, v21.1
  - CCA-06 (tomographic model)
  - 1D background model
- 1D background model is based on the Sierra geologic region in the SFCVM model
- Gabbro modification applied to SFCVM model
- Merged taper is applied to all regions
  - Top 700m
  - Based on Thompson Vs30 values
- Surface point populated at depth of 20m
- Smoothing applied 20km from all interfaces

Study 24.8 Data Products Overview

- Seismograms, PGV, PGA, RotD, durations as in previous studies
  - Calculation of geometric mean PSA removed
- Addition of new data products
  - 3-component seismograms
  - Vertical response spectra
  - Period-dependent durations
- Fourier spectra planned for calculation after the study
- Hazard curves, hazard maps
- To be made available through CS Data Access Tool

Study 24.8 Data Products – LF

- Seismograms: **3-component**, 10000 timesteps (400 sec)
- RotD:
  - PGV, RotD50, RotD100 + azimuth at 27 periods: https://strike.scec.org/scecpedia/CyberShake_Study_24.1#Deterministic
  - 10, 7.5, 5, 4, 3, 2 sec inserted into the database **for RotD50 only** (6 values per event)
- Durations:
  - X and Y components: energy integral, Arias intensity, CAV, and 5-75%, 5-95%, 20-80% for vel and acc
  - 5-75% and 5-95% for acceleration for both X and Y inserted into the database (4 per event)
- **Vertical response spectra**
  - **Same 27 periods**
  - **No DB insertions**
- **Period-dependent durations**
  - **5-75%, 5-95%, 20-80% at same 27 periods for X and Y**
  - **No DB insertions**
- Curves and maps at 10, 5, 3, 2 sec

Study 24.8 Data Products – BB

- Seismograms: **3-component**, 40000 timesteps (400 sec)
- RotD:
  - PGV, RotD50, RotD100 + azimuth at 68 periods (0.01-20 sec)
  - PGA, PGV, 10, 7.5, 5, 4, 3, 2, 1, 0.75, 0.5, 0.4, 0.3, 0.2, 0.1, 0.075, 0.05, 0.04, 0.03, 0.02, 0.01 sec inserted into the database **for RotD50 only** (21 values per event)
- Durations:
  - X and Y components: energy integral, Arias intensity, CAV, and 5-75%, 5-95%, 20-80% for vel and acc
  - 5-75% and 5-95% for acceleration for both X and Y inserted into the database (4 per event)
- **Vertical response spectra**
  - **Same 68 periods**
  - **No DB insertions**
- **Period-dependent durations**
  - **5-75%, 5-95%, 20-80% at same 68 periods**
  - **No DB insertions**
- Curves and maps at 10, 5, 3, 2, 1, 0.5, 0.2, 0.1 sec

Current Status

- Stress test of first 20 sites complete
- Evaluating results before continuing with remaining 295 sites
- Targeting end of November for study completion