GROUND MOTION MAPS

How To Obtain the Basic Values

Seismic Ground Motions

1 **Determine basic values from maps for bedrock conditions**

2, 3 Classify soil conditions at site and determine site coefficients

4 Determine site-adjusted values

4 Take two-thirds for use in design

5 Construct design response spectrum

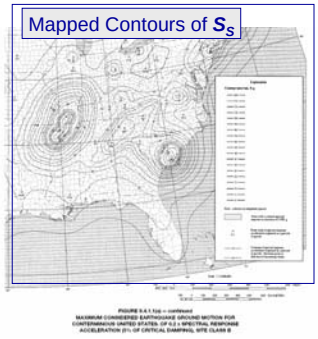
7 Site-specific studies permitted/required

Mapped Acceleration Parameters

- Two sets of maps; acceleration parameter is in units of gravity
- S_S for spectral response acceleration at 0.2 sec
- S_1 for spectral response acceleration at 1.0 sec
- Shortcut to Seismic Design Category A:
  - $S_S < 0.15$ and $S_1 < 0.04$

Ground Motion Parameters & Seismic Hazard

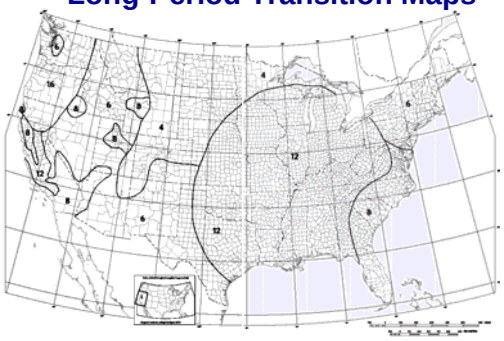
Mapped Contours of S_S



S_S and S_1 are the mapped 2% in 50 year spectral accelerations for firm rock

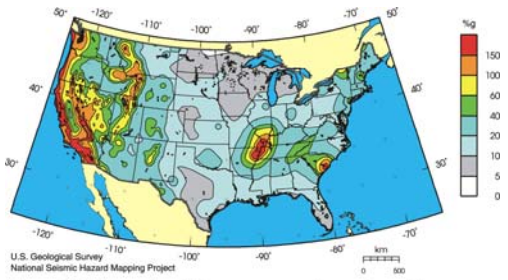
S_{DS} and S_{D1} are the design level spectral accelerations (modified for site and "expected good performance")

Long-Period Transition Maps



Location of Deterministic Areas

Typical Probabilistic Map



S_S - 0.2 Spectral Response Acceleration

CD vs Internet

- Internet
- CD
- Both sources give the same answers
- Both sources have a similar user interface
- The graphics are somewhat different

Internet Ground Motion Tool

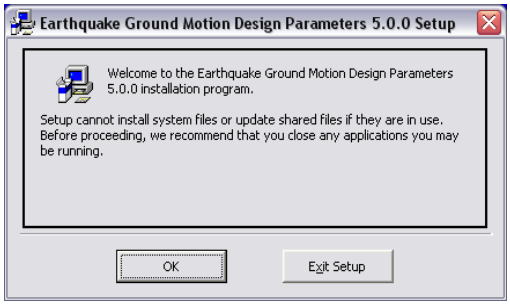
http://earthquake.usgs.gov/research/hazmaps/

SEISMIC DESIGN VALUES FOR BUILDINGS

S_s and S_1, Hazard Curves, Uniform Hazard Spectra, and Residential Design Category

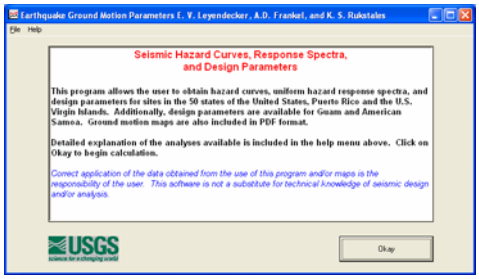
USGS Ground Motion Calculator

Installation

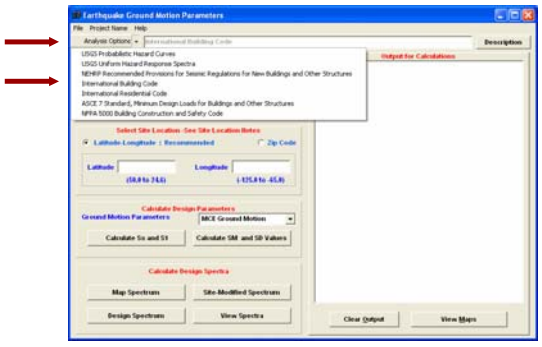


Installation Caution

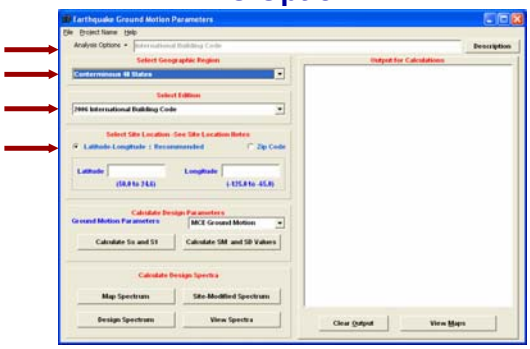
Opening Screen



Analysis Options

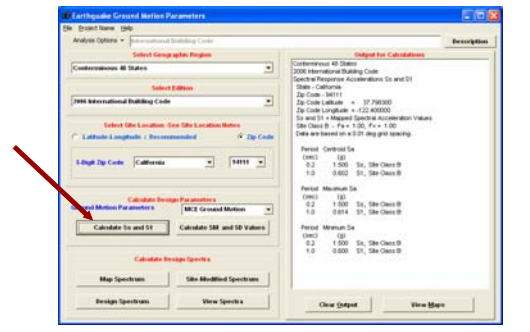


IBC Option

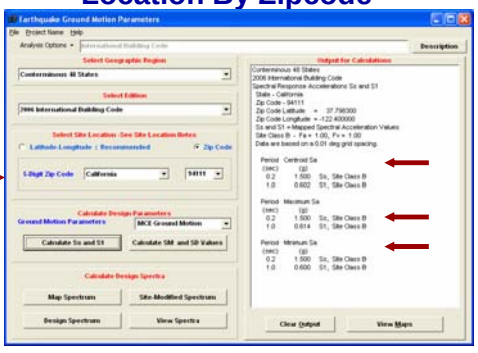


User Aids

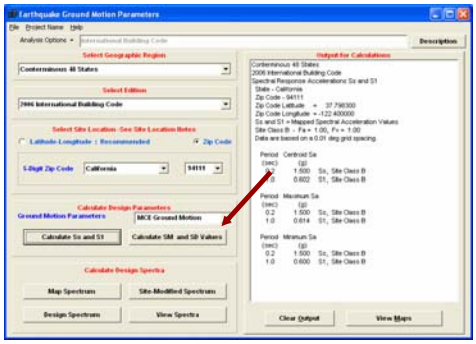
Calculate S_S AND S_1



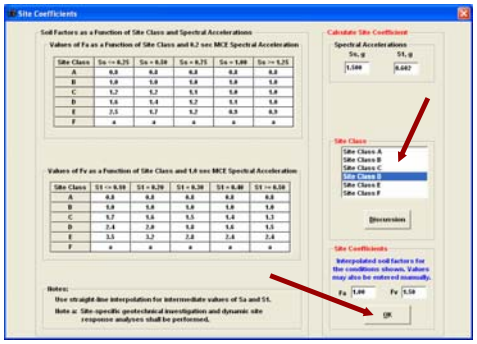
Location By Zipcode



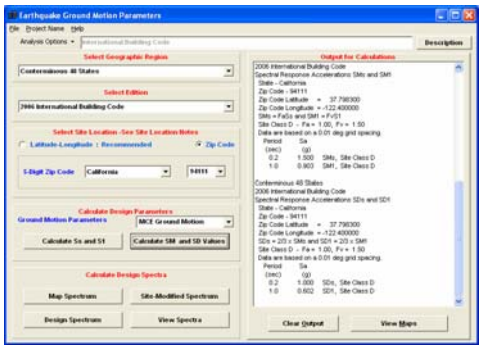
Calculate S_{MS}, S_{M1}, S_{DS}, S_{D1}



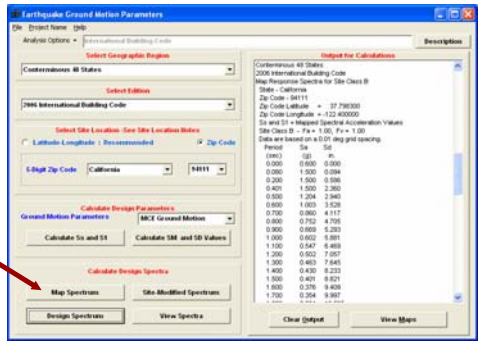
Calculate Site Coefficients



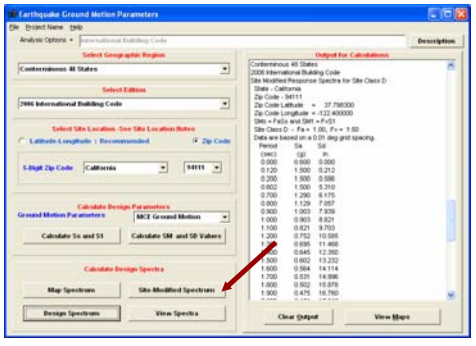
S_{MS}, S_{M1}, S_{DS}, S_{D1} Values



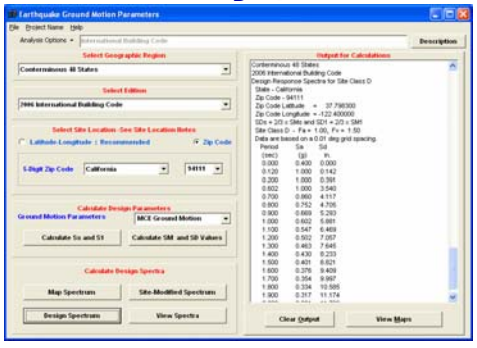
Calculate MCE Spectrum



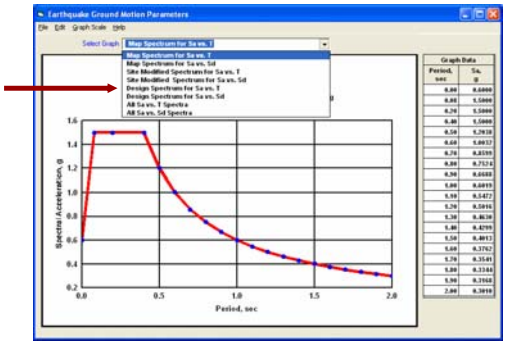
Calculate S_M Spectrum



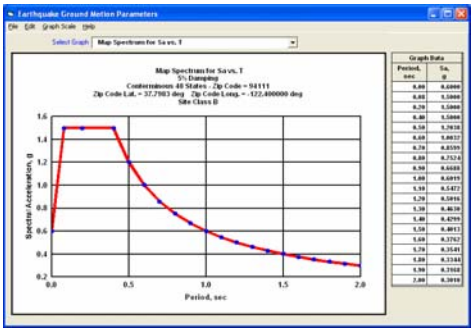
Calculate S_D Spectrum



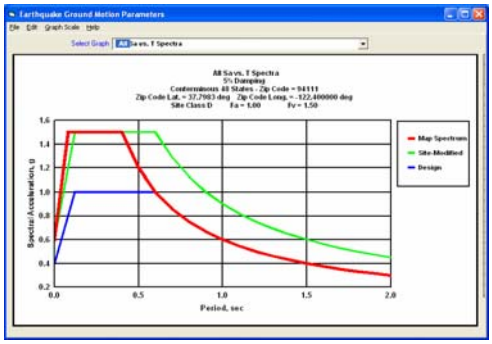
Graphic Options



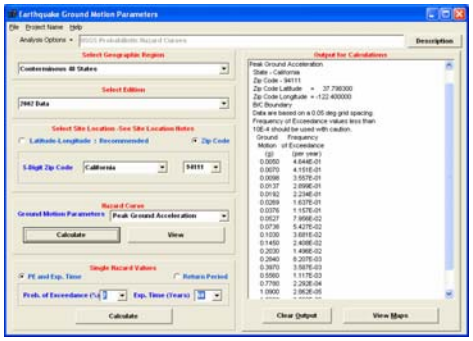
Map Spectrum: S_a - T



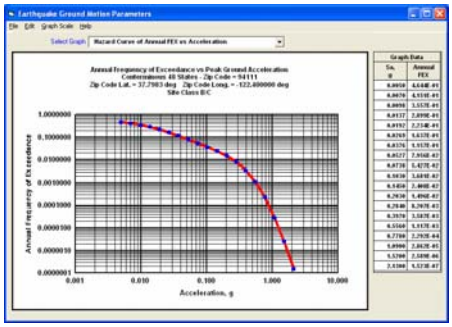
All Spectra: S_a - T



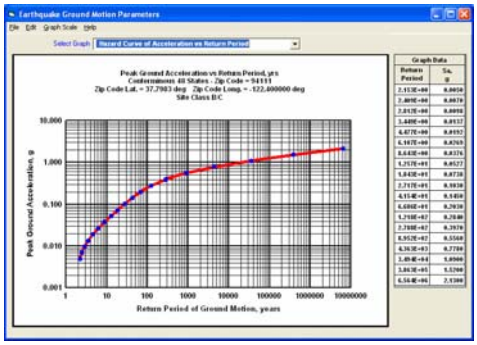
Calculate Hazard Curves



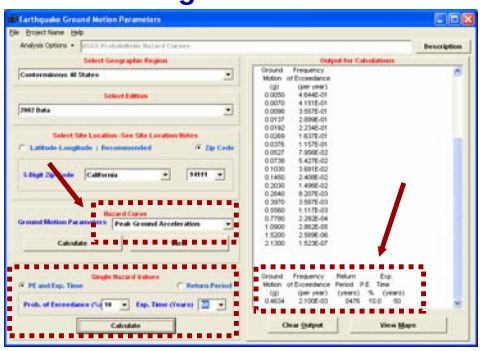
Annual Frequency of Exceedance



Return Period



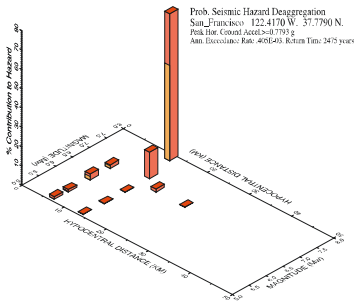
Single Values



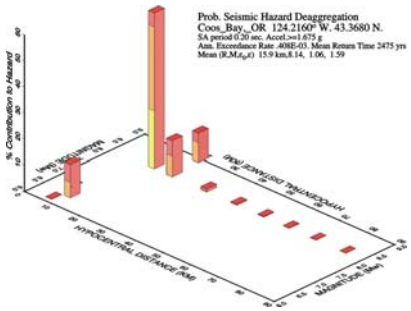
Deaggregation

- Breaking apart of the probabilistic hazard analysis
- Helps remove some of the “black box” effect
- Helps visualize the source of the hazard
- Many uses, e.g. liquefaction analysis, time history determination

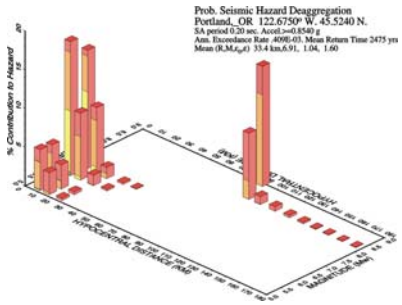
Deaggregation – San Francisco



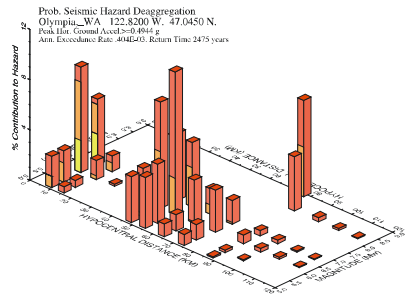
Deaggregation - Coos Bay, Oregon



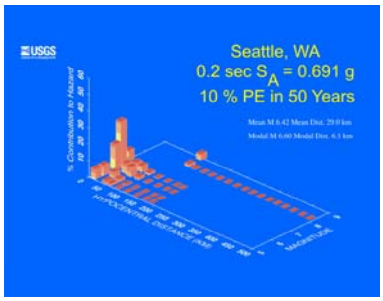
Deaggregation - Portland, Oregon



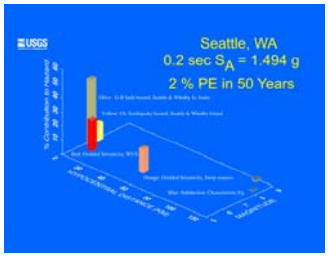
Deaggregation – Olympia, Washington



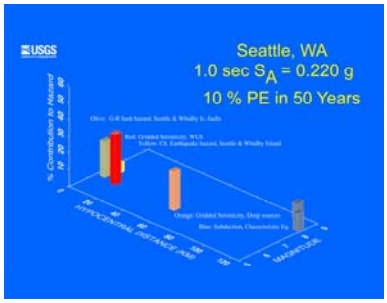
Seattle – 0.2 sec, Detailed



Seattle – 0.2 sec



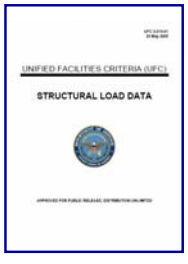
Seattle – 1.0 sec



Design Values Outside the United States

- Based on GASHAP Data
- 10% PE in 50 years
- PGA only
- Estimate 2% from 10% PE by multiplying by 2.0
- S_s = 2.5xPGA
- S_1 = PGA
- Use site-specific studies where available
- USGS studies where available

UFC 3-310-1



What is GSHAP?