



Record**S**election**a**nd**S**caling Program

A MATLAB based GUI (Graphical User Interface)
to select & scale ground motion records for
nonlinear RHA of Structural Systems

ReSaS – Main Window

Candidate Record Selection Toolbox

Mw,min: Mw,max: Displacement:

RJB,min (km): RJB,max (km): log:

Vs30,min (m/s): Vs30,max (m/s):

Normal Strike Slip Reverse Refresh:

Maximum Number of Candidate Records:

Target

Intensity Measure:

Single Spectral Ordinate:

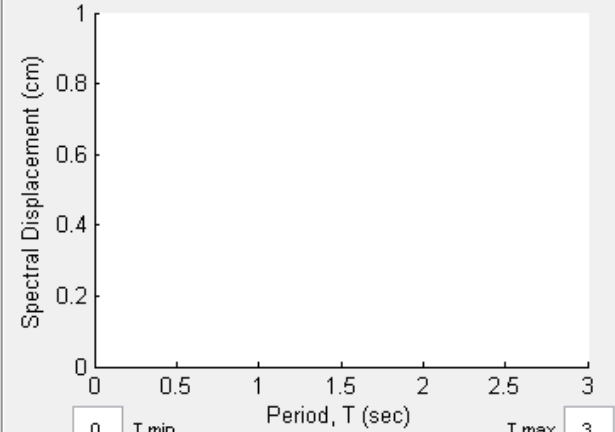
User Defined Spectrum:

Structural System Properties

Fundamental Period (s): <input type="text" value="0.5"/>	Damping Factor (%): <input type="text" value="5"/>
Lower Factor of Fundamental Period: <input type="text" value="0.2"/>	Strength Reduction Factor (R): <input type="text" value="4.5"/>
Upper Factor of Fundamental Period: <input type="text" value="2.0"/>	Post Yield Stiffness Ratio (%): <input type="text" value="3"/>

Final Ground Motion Records

Plot Average Scaled Spectrum Plot Target



Selection & Scaling Toolbox

Required Number of Scaled Records:

ESB Selection & Scaling

Methodology

Single Spectral Target (Ay and Akkar, 2012)

Spectrum Mean And Variance Matching (Ay, 2012) Adjustment for the relative importance of the difference in the observed and target mean and standard deviation (%):

CMS (Baker, 2011)

Methodology

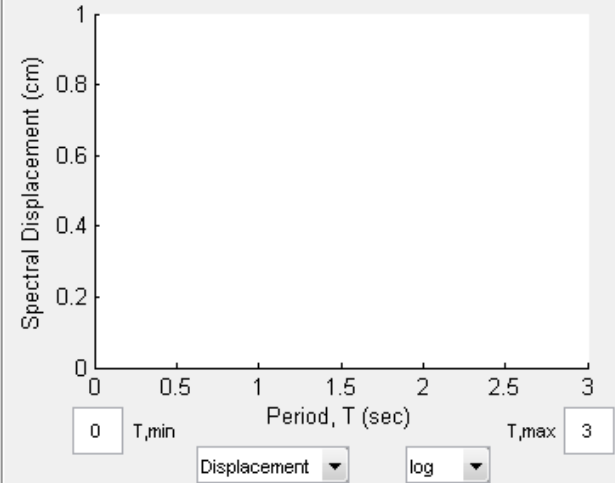
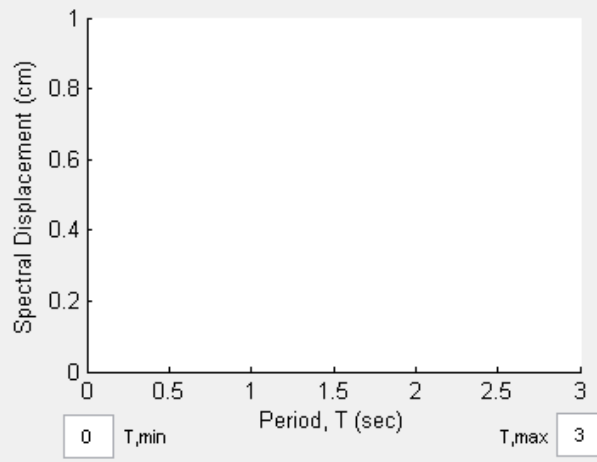
Stripe Scaling

Spectrum Scaling

Horizontal Component of Motion

Individual Component

Geometric Mean



Candidate Record Selection Toolbox

ReSaS

Candidate Record Selection Toolbox

Mw,min: 6.25 Mw,max: 6.75 Displacement:

RJB,min (km): 10 RJB,max (km): 50 log:

Vs30,min (m/s): 200 Vs30,max (m/s): 700

Normal Strike Slip Reverse Refresh

Maximum Number of Candidate Records: 20

Determine Candidate Records

Selection & Scaling Toolbox

Required Number of Scaled Records: 10

ESB Selection & Scaling

Methodology

Single Spectral Target (Ay and Akkar, 2012)

Spectrum Mean And Variance Matching (Ay, 2012) Adjustment for the relative importance of the difference in the observed and target mean and standard deviation (%): 50

CMS (Baker, 2011)

Methodology

Stripe Scaling Spectrum Scaling

Horizontal Component of Motion

Individual Component Geometric Mean

Run

Target

Intensity Measure: SA (g)

Single Spectral Ordinate: 12.6

User Defined Spectrum: File Path and Name Browse

Structural System Properties

Fundamental Period (s): 0.5 Damping Factor (%): 5

Lower Factor of Fundamental Period: 0.2 Strength Reduction Factor (R): 4.5

Upper Factor of Fundamental Period: 2.0 Post Yield Stiffness Ratio (%): 3

Final Ground Motion Records

Plot Average Scaled Spectrum Plot Target

Spectral Displacement (cm) vs. Period, T (sec)

Refresh

Input: Target & Structural Parameters

The screenshot displays the ReSaS software interface, which is used for seismic record selection and scaling. The interface is divided into several sections:

- Candidate Record Selection Toolbox:** Contains input fields for Mw_{min} (6.25), Mw_{max} (6.75), RJB_{min} (10 km), RJB_{max} (50 km), $Vs30_{min}$ (200 m/s), and $Vs30_{max}$ (700 m/s). It also includes a dropdown menu for "Displacement" (set to "log"), checkboxes for "Normal", "Strike Slip", and "Reverse", a "Refresh" button, and a "Maximum Number of Candidate Records" field (set to 20). A "Determine Candidate Records" button is highlighted in green.
- Selection & Scaling Toolbox:** Contains a "Required Number of Scaled Records" field (set to 10). It has two main sections: "ESB Selection & Scaling" with "Single Spectral Target (Ay and Akkar, 2012)" selected and "Spectrum Mean And Variance Matching (Ay, 2012)" with an adjustment value of 50; and "CMS (Baker, 2011)" with "Stripe Scaling" selected under "Methodology" and "Individual Component" selected under "Horizontal Component of Motion". A "Run" button is highlighted in green.
- Target Panel:** Contains "Intensity Measure" (SA (g)), "Single Spectral Ordinate" (12.6), and "User Defined Spectrum" (with "File Path and Name" and "Browse" buttons).
- Structural System Properties:** Contains fields for "Fundamental Period (s)" (0.5), "Damping Factor (%)" (5), "Lower Factor of Fundamental Period" (0.2), "Strength Reduction Factor (R)" (4.5), "Upper Factor of Fundamental Period" (2.0), and "Post Yield Stiffness Ratio (%)" (3).
- Final Ground Motion Records:** Contains checkboxes for "Plot Average Scaled Spectrum" and "Plot Target", and a plot area showing "Spectral Displacement (cm)" vs "Period, T (sec)".

A blue arrow points from the "Input: Target & Structural Parameters" title to the "Target" and "Structural System Properties" panels.

Selection and Scaling Toolbox

The image displays the ReSaS software interface, which is used for seismic record selection and scaling. The interface is divided into several sections:

- Candidate Record Selection Toolbox:** This section allows users to define search criteria for candidate records. It includes input fields for M_w (min: 6.25, max: 6.75), RJB (min: 10 km, max: 10 km), and V_s30 (min: 200 m/s, max: 700 m/s). There are also checkboxes for Normal, Strike Slip, and Reverse fault types, and a Refresh button. A "Determine Candidate Record" button is highlighted in green.
- Selection & Scaling Toolbox:** This section is highlighted with a blue border and contains options for the required number of scaled records (10) and the selection methodology. The "ESB Selection & Scaling" methodology is selected, with "Single Spectral Target (Ay and Akkar, 2012)" chosen. An adjustment parameter for the relative importance of the difference in the observed and target mean and standard deviation is set to 50%. Other options include CMS (Baker, 2011) with Stripe Scaling and Individual Component selected. A Run button is present at the bottom right.
- Target:** This section defines the target seismic intensity. The "Intensity Measure" is set to SA (g), and the "Single Spectral Ordinate" is set to 12.6. There is also a "User Defined Spectrum" option with a "Browse" button for file path and name.
- Structural System Properties:** This section defines the properties of the structural system, including Fundamental Period (0.5 s), Damping Factor (5%), Lower Factor of Fundamental Period (0.2), Strength Reduction Factor (R) (4.5), Upper Factor of Fundamental Period (2.0), and Post Yield Stiffness Ratio (3%).
- Final Ground Motion Records:** This section contains checkboxes for "Plot Average Scaled Spectrum" and "Plot Target". It also includes a plot area showing Spectral Displacement (cm) versus Period, T (sec).

Two plots are visible, both showing Spectral Displacement (cm) on the y-axis (ranging from 0 to 1) and Period, T (sec) on the x-axis (ranging from 0 to 3). The top plot is currently empty, while the bottom plot is also empty but includes a "Refresh" button below it. A blue arrow points from the "Determine Candidate Record" button to the top of the plot area.

Output: Final Ground Motion Records

The screenshot displays the ReSaS software interface, which is used for selecting and scaling ground motion records. The interface is divided into several sections:

- Candidate Record Selection Toolbox:** Contains input fields for M_w (min: 6.25, max: 6.75), RJB (min: 10 km, max: 50 km), and V_{s30} (min: 200 m/s, max: 700 m/s). It also includes checkboxes for Normal, Strike Slip, and Reverse fault types, a Maximum Number of Candidate Records (20), and a Determine Candidate Records button.
- Selection & Scaling Toolbox:** Includes a Required Number of Scaled Records (10) and radio buttons for ESB Selection & Scaling (Single Spectral Target, Spectrum Mean And Variance Matching) and CMS (Baker, 2011). It also features Methodology and Horizontal Component of Motion options.
- Target:** Includes an Intensity Measure (SA (g)) and a value of 12.6. It also has a User Defined Spectrum option with a File Path and Name field and a Browse button.
- Structural System Properties:** Includes input fields for Fundamental Period (0.5 s), Damping Factor (5%), Lower Factor of Fundamental Period (0.2), Strength Reduction Factor (R) (4.5), Upper Factor of Fundamental Period (2.0), and Post Yield Stiffness Ratio (3%).
- Final Ground Motion Records:** A plot showing Spectral Displacement (cm) vs. Period, T (sec). It includes checkboxes for Plot Average Scaled Spectrum and Plot Target, and a Refresh button.

Two plots are shown, both displaying Spectral Displacement (cm) on the y-axis (0 to 1) and Period, T (sec) on the x-axis (0 to 3). A blue arrow points from the top plot to the bottom plot, indicating the flow of data or the final output.

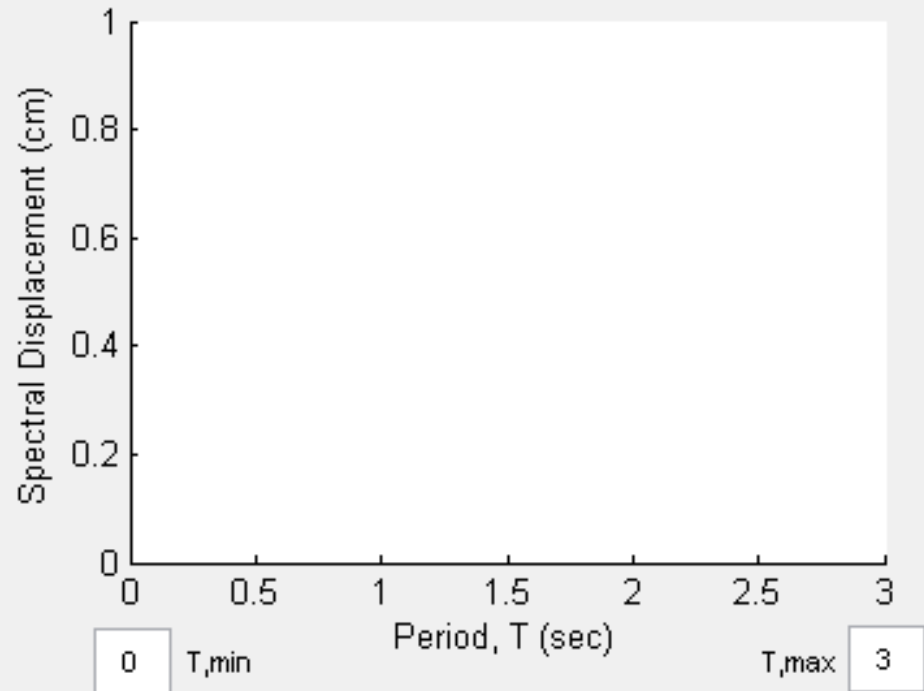
Candidate Record Selection Toolbox

- The program includes 260 ground motion records
- Among these the required number of candidate records can be selected according to the ground motion parameters; M_w , R_{JB} , V_{S30} , Style-of-Faulting

Candidate Record Selection Toolbox

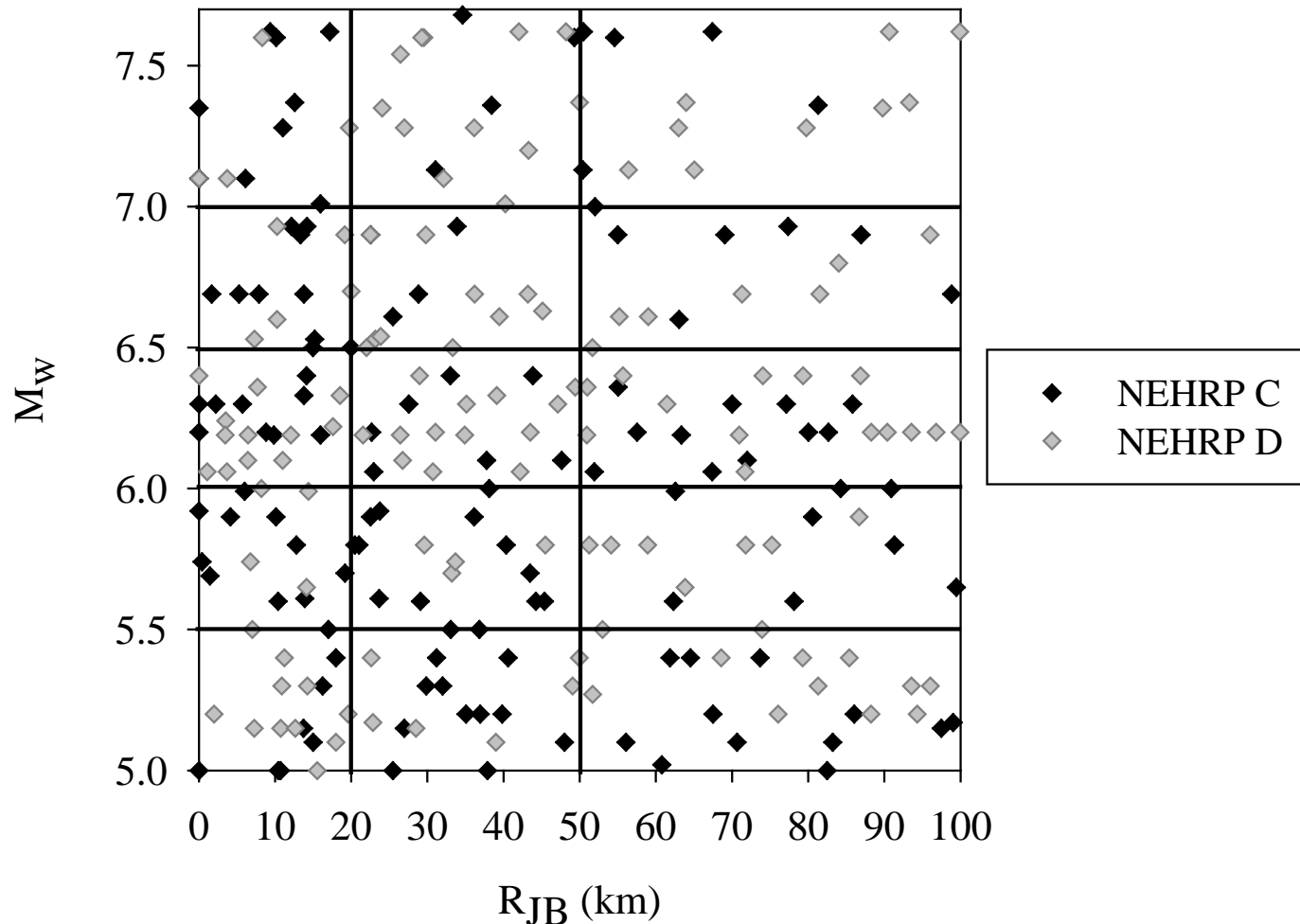
Mw,min	<input type="text" value="6.25"/>	Mw,max	<input type="text" value="6.75"/>	Displacement <input type="button" value="v"/>
RJB,min (km)	<input type="text" value="10"/>	RJB,max (km)	<input type="text" value="50"/>	log <input type="button" value="v"/>
Vs30,min (m/s)	<input type="text" value="200"/>	Vs30,max (m/s)	<input type="text" value="700"/>	
<input type="checkbox"/> Normal	<input type="checkbox"/> Strike Slip	<input type="checkbox"/> Reverse	<input type="button" value="Refresh"/>	

Maximum Number of Candidate Records



Candidate Record Selection Toolbox

- The program provides relatively homogeneous GM Database to the user

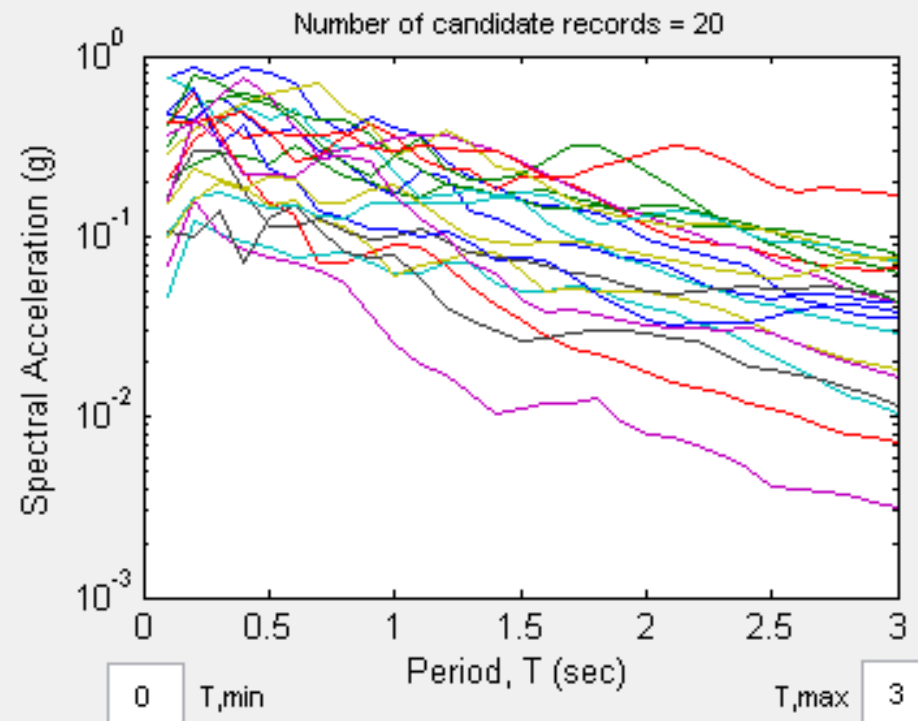


Candidate Record Selection Toolbox

- For the sake of speed, the number of candidate records can be limited by the user

Candidate Record Selection Toolbox

Mw,min	<input type="text" value="6.25"/>	Mw,max	<input type="text" value="6.75"/>	Acceleration <input type="button" value="v"/>
RJB,min (km)	<input type="text" value="10"/>	RJB,max (km)	<input type="text" value="50"/>	log <input type="button" value="v"/>
Vs30,min (m/s)	<input type="text" value="200"/>	Vs30,max (m/s)	<input type="text" value="700"/>	
<input type="checkbox"/> Normal	<input type="checkbox"/> Strike Slip	<input type="checkbox"/> Reverse	<input type="button" value="Refresh"/>	
Maximum Number of Candidate Records	<input type="text" value="20"/>			



Input: Target & Structural Parameters

Target

Intensity Measure: SA (g) ▼

Single Spectral Ordinate: 12.6

User Defined Spectrum: File Path and Name [Browse]

Structural System Properties

Fundamental Period (s)	0.5	Damping Factor (%)	5
Lower Factor of Fundamental Period	0.2	Strength Reduction Factor (R)	4.5
Upper Factor of Fundamental Period	2.0	Post Yield Stiffness Ratio (%)	3

- Target; either **single spectral ordinate** or **user defined spectrum** (UHS, CMS, design spectrum, etc.) in terms of **SA** or **SD**

- Structural System Properties
- Period, Upper and Lower boundaries of period
- Strength Reduction and Post-yield stiffness ratio

Selection and Scaling Toolbox

- The main engine use either ESB (EpsilonSigma Based; Ay and Akkar, 2012) or CMS (Baker, 2011) based selection & scaling methodology

Selection & Scaling Toolbox

Required Number of Scaled Records

ESB Selection & Scaling

Methodology

Single Spectral Target (Ay and Akkar, 2012)

Spectrum Mean And Variance Matching (Ay, 2012)

Adjustment for the relative importance of the difference in the observed and target mean and standard deviation (%)

CMS (Baker, 2011)

Methodology

Stripe Scaling

Spectrum Scaling

Horizontal Component of Motion

Individual Component

Geometric Mean

Run

Selection and Scaling Toolbox

- ESB Selection and scaling Toolbox
- Single Spectral Target Matching
- Spectrum Mean and Variance Matching

Selection & Scaling Toolbox

Required Number of
Scaled Records

ESB Selection & Scaling

Methodology

Single Spectral Target (Ay and Akkar, 2012)

Spectrum Mean And Variance Matching (Ay, 2012)

Adjustment for the relative importance of the difference in
the observed and target mean and standard deviation (%)

- Relative importance of the difference in
Scaled mean & Target Mean vs.
Scaled variance & Target Variance

Selection and Scaling Toolbox

- CMS based selection and Scaling
- Either Stripe or Spectrum Scaling
- Individual or Geometric Mean as the horizontal component definition

CMS (Baker, 2011)

Methodology

Stripe Scaling

Spectrum Scaling

Horizontal Component of Motion

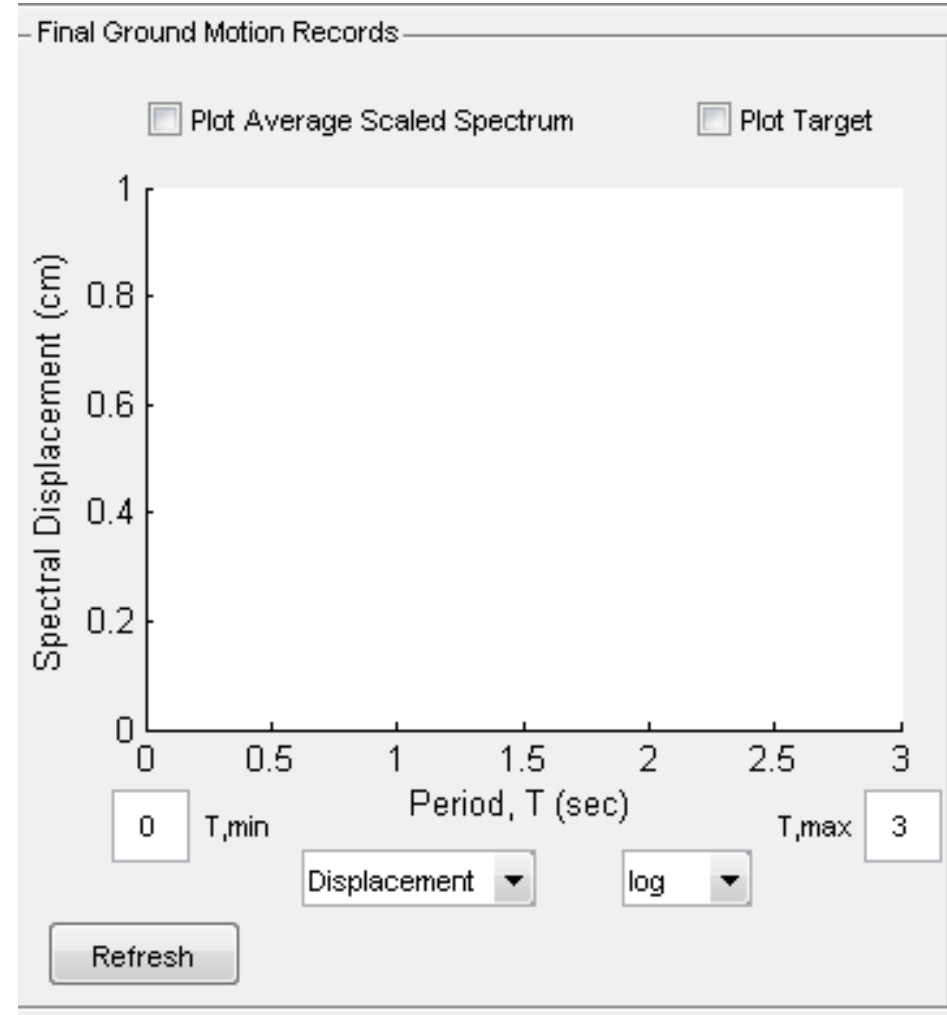
Individual Component

Geometric Mean

Run

Output: Final Ground Motion Records

- To observe the spectra (individual spectrum and corresponding average) of final ground motion recordings
- Also to observe the Target spectrum



Output: Final Ground Motion Records

- To observe the spectra (individual spectrum and corresponding average) of final ground motion recordings
- Also to observe the Target spectrum

