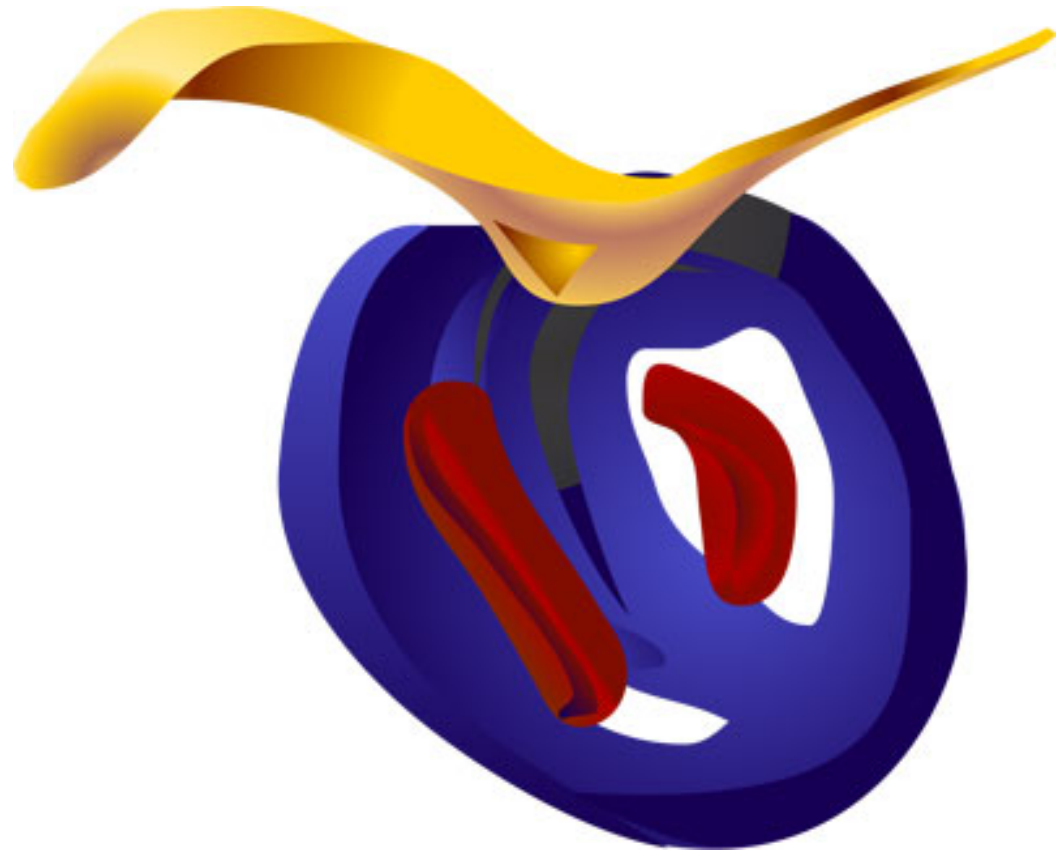


# GEE User Handbook

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## 1. About this Manual

The purpose of this manual is to help to get new users started with the Global Earthquake Explorer. It is an ever-evolving document. Currently, it includes just the basics, but GEE's more advanced features will be documented in the manual over time. If you simply can't wait, feel free to start pressing buttons and exploring! Once you are familiar with the basic functions and behavior of GEE, the more advanced options will start making sense!

### What to expect:

First, you will be instructed on how to download and install the program. Then, you will get acquainted with the basics of GEE. After you feel comfortable with the basics, you will explore with some of GEE's more advanced features. Next, you will learn about GEE's Structured Learning Modules. The last section of the manual consists of the appendices, which will help you with any problems you may be having with the installation of the program or with your internet connection. The GEE Manual also includes a Quick Reference Guide, which lists the most important tools you will use in the program and their functions.

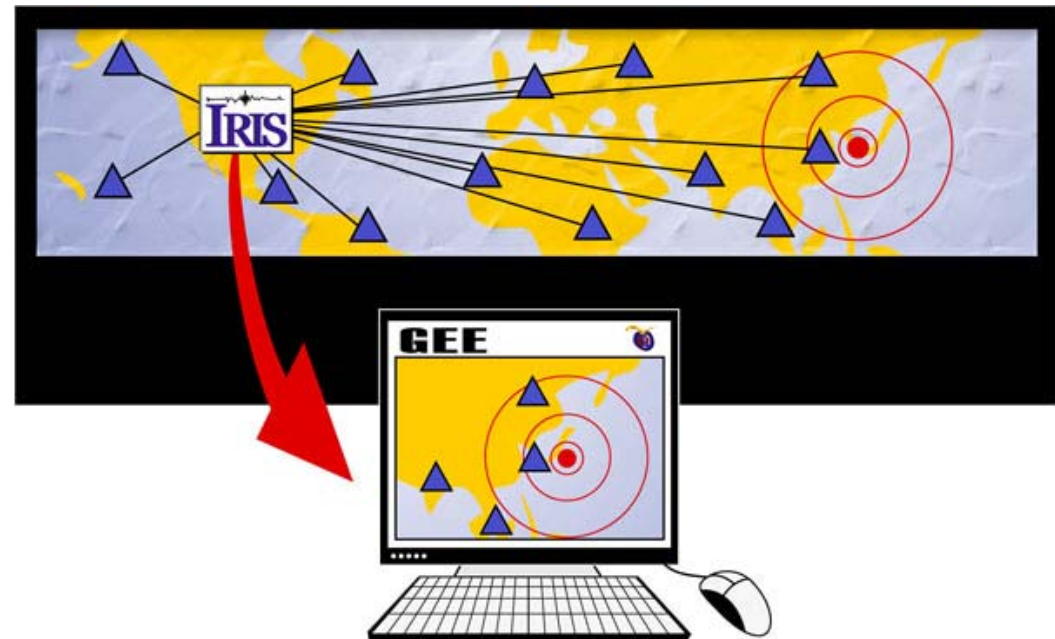
This version of the GEE Manual is intended for use with Version 2.1.1 of the program. Be advised that later versions of GEE may include features not discussed in this manual. For updates on the manual and information about GEE releases, visit <http://www.seis.sc.edu/GEE>.



## 2. What is GEE?

The Global Earthquake Explorer (GEE) is a program designed to allow you to access, view, and analyze earthquake seismograms recorded throughout the world. Within minutes of a significant earthquake anywhere in the world, seismograms of that earthquake are transmitted to central recording facilities for analysis by professional seismologists. GEE accesses these same data sources and provides an intuitive, map-based interface, which allows even novices to easily select the earthquakes and seismograph stations of their choice. GEE then uses the Internet to deliver seismograms to the user's computer with a single click of a mouse. This is the obvious software of choice for students, teachers, and amateur seismologists who are curious about earthquakes. It is also a teaching tool, designed with education in mind, and offers teachers a simple and fun way to introduce their students to the world of seismology. GEE includes several Structured Learning Modules that help to develop an elementary understanding of the physical principles behind earthquakes and seismology.

GEE accesses worldwide data primarily through the archives of the IRIS Data Management Center in Seattle. Seismograms in this archive are from stations around the world operated by many different institutions. IRIS, the U.S. Geological Survey, and their equivalents in other countries are the primary contributors. In addition, regional seismograph networks in earthquake-prone regions such as California, Washington, and Utah contribute data available through GEE.



**Figure 1** *How GEE Gathers Data*

### 3. System Requirements:

GEE runs on most major computer operating systems, including Microsoft Windows and Apple OSX. In the main text of this handbook, we cover only the Microsoft Windows system and installation requirements. Information for other systems can be found in **Appendix A**.

A high-speed data connection is recommended under all Operating Systems. All of GEE's features can work over a dial-up Internet connection, but performance may be seriously compromised. The Structured Learning Modules (described later) are self-contained within GEE and do not require an Internet connection. This allows these learning modules to be reliably used in a classroom setting even when the Internet goes out (a rare occurrence in schools!).

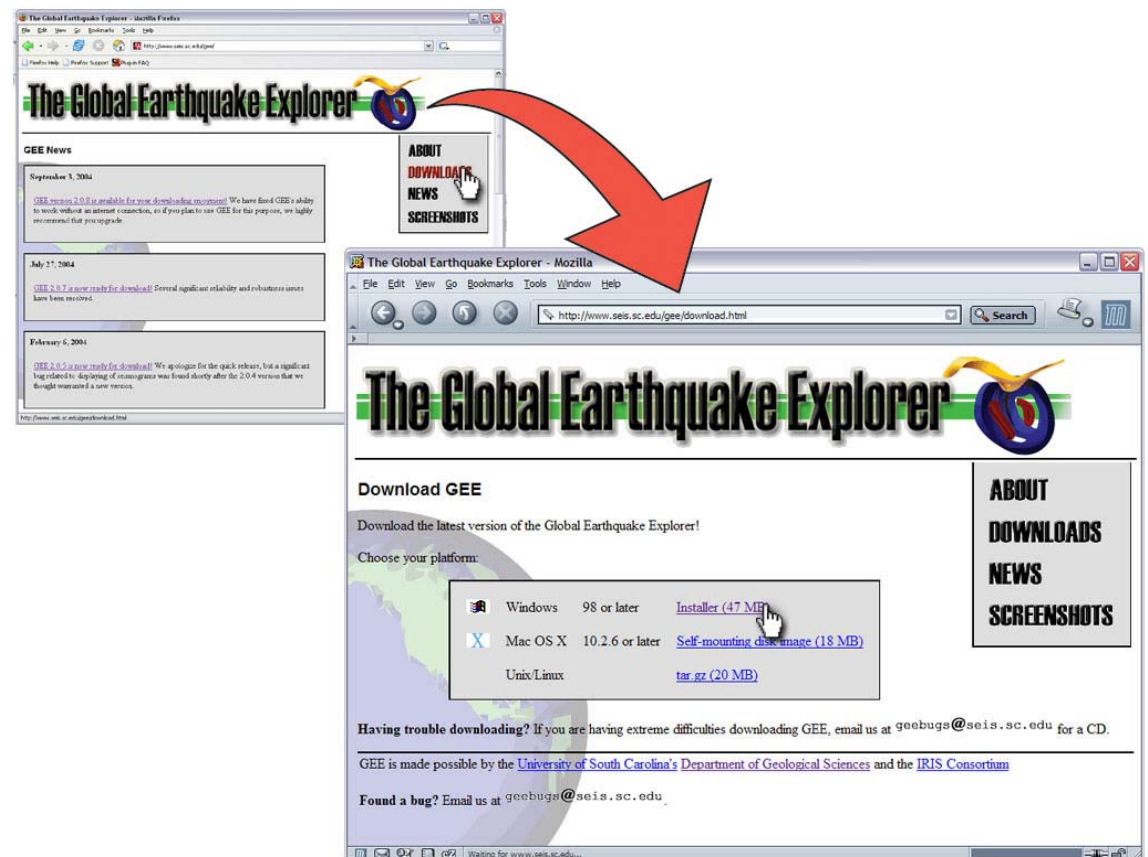
#### PC Hardware Requirements:

Windows® 98 or higher  
200Mhz Pentium® or better processor  
32Mbytes RAM  
60Mbytes free Hard Drive space

### 4. Downloading GEE

1. Go to **[www.seis.sc.edu/GEE](http://www.seis.sc.edu/GEE)**. This site will have up-to-date information on recent changes to GEE. For now, all you need to do is:
2. Click the **Downloads** button in the upper right hand corner of the web pages\*. You should then be looking at a web page that looks like the one shown in **Figure 2** to the right.
3. Choose the version of GEE for your operating system (Windows, Mac, or Unix/Linux).
4. Next, you will be asked to save the file to disk. Click OK and you have successfully downloaded GEE.

\*You can also get GEE via CD-ROM. Simply e-mail [geebugs@seis.sc.edu](mailto:geebugs@seis.sc.edu) with your request.



**Figure 2** Downloading from the GEE Website

## 5. Installing GEE:

### PC:

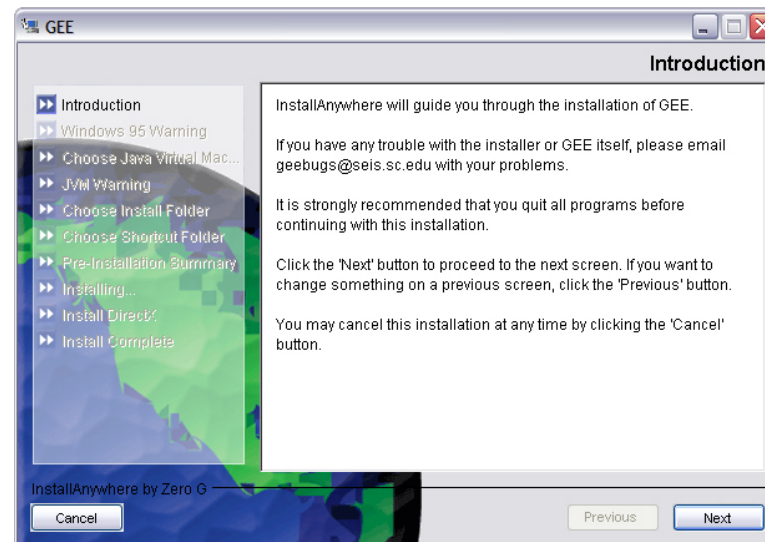
If you are going to be using GEE on a school system, you may need to have your system administrator give you permission to install it.

1. Once you have the installer, double click the `gee_install.exe` file (as seen in **Figure 3**) that should be on your desktop.

2. The GEE installer (**Figure 4**) will guide you through the installation process. If at any point during the install process you are unsure what the installer is asking you, the default settings should be used. It is suggested that you quit all other programs before installing because at the end of the installation you may be prompted to restart your computer in order to apply all of the changes you have made to your system.

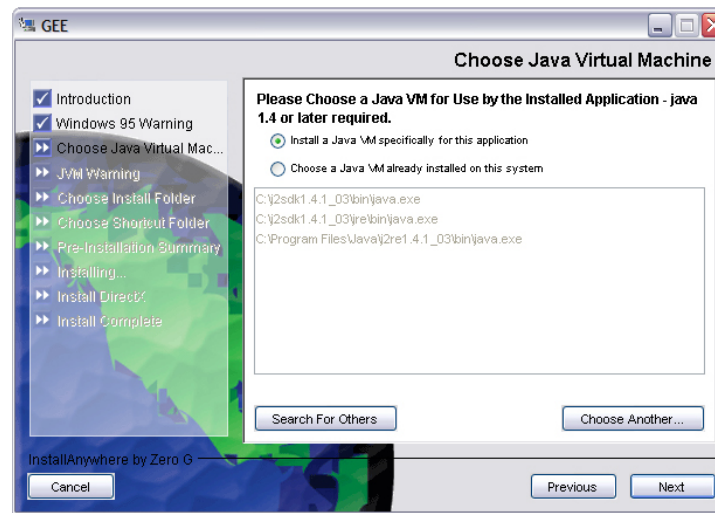


**Figure 3** *Installer Icon*



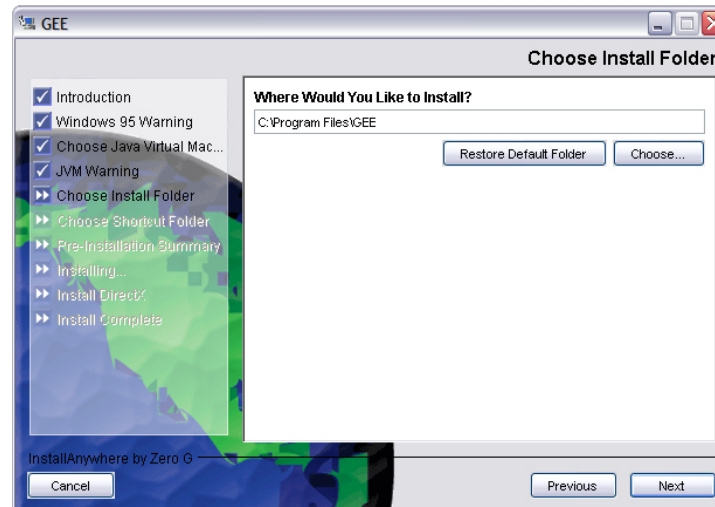
**Figure 4** *Introduction to the Install Process*

3. It is recommended that you install a Java Virtual Machine specifically for GEE when prompted. This is the default for this screen. If you choose to use a pre-existing Java VM, be sure that it is version 1.4.1\_03 or newer.



**Figure 5** Choosing a Java VM

4. The GEE installer will next ask where you want to install GEE on your hard drive. The default setting is C:\Program Files\GEE.

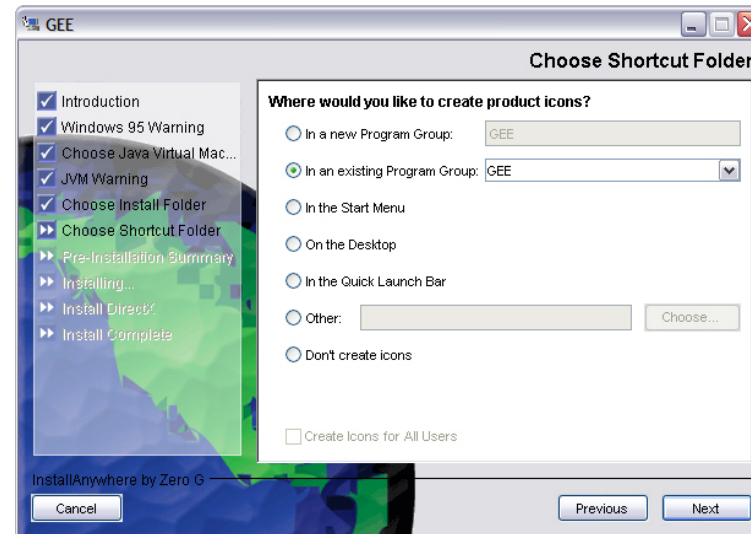


**Figure 6** Choosing Where to Install

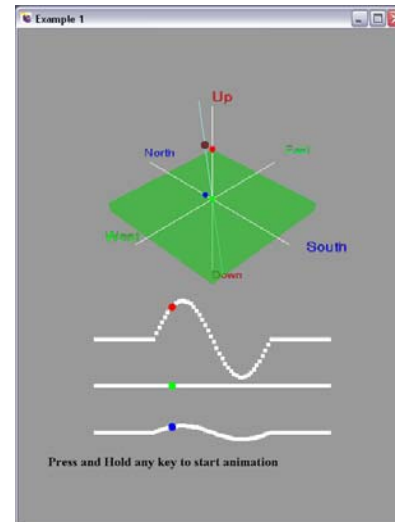


5. The installer also will ask you where you want shortcuts placed. For the purposes of this manual, we will assume that you have placed a shortcut in the Start menu.

6. After all GEE files have been copied to your hard drive, the GEE installer will look on your computer for a Microsoft software package called “DirectX”. DirectX is simply a technology developed by Microsoft that facilitates the displaying of multimedia elements such as full-color graphics, video, and 3-D animation on your computer. If the installer finds that DirectX needs to be updated on your system, it will attempt to do so. Once DirectX is updated, it will ask you to restart your computer so that the changes can be applied. If for any reason you have trouble installing DirectX, please refer to **Appendix A**. Also, you should understand that the Particle Motion Animation (seen in **Figure 8**) is the only component of GEE that uses DirectX so if you face insurmountable obstacles while attempting to update DirectX, all is not lost. The Particle Motion Animation is used in the Longitudinal and Transverse Waves Learning Module, however, you will be able to use most of this module and the rest of GEE without DirectX. You can find the Particle Motion Animation demo by clicking on **Explore Recent Earthquakes** in the Main Screen, then by selecting **Tools** from the menu at the top of the screen, then **Particle Motion Animation Demo**. If you need to know how to install GEE under other operating systems, have any problems during the install, or need help installing DirectX, please refer to **Appendix A**.



**Figure 7** Choosing Shortcuts

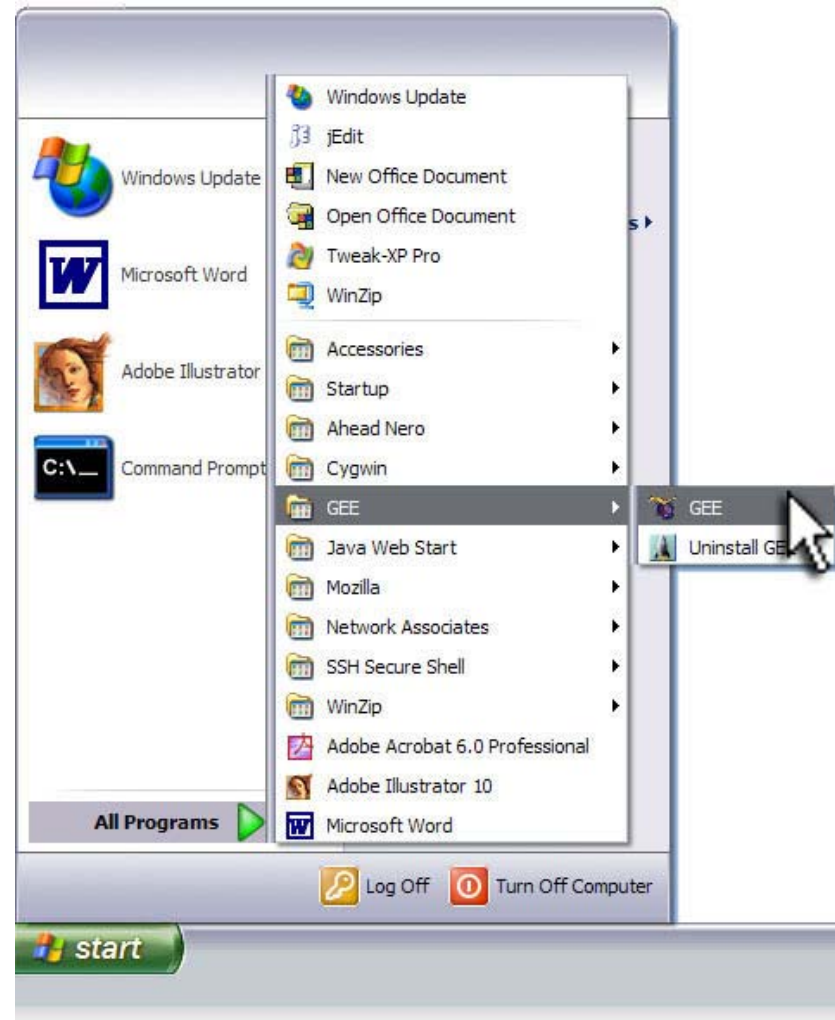


**Figure 8** Particle Motion Animation

## 6. Getting Acquainted with GEE

### 6.a Starting GEE

As stated earlier, this manual assumes that you have chosen to place a shortcut in the start menu. If you did this, simply open the start menu and select the GEE folder from the program list. Then select the GEE application to start. This process is shown in **Figure 9**.



**Figure 9** Starting GEE from the Start Menu

If you chose to install a shortcut on your desktop, simply double click the GEE icon, which will look like the one in **Figure 10**. If you do not have an icon on your desktop and would like one, simply right-click on the program in the start menu and choose “create shortcut” from the menu that pops up. The new shortcut should appear at the bottom of your program list window. Now click on it and drag it to your desktop.



**Figure 10** GEE Desktop Icon



## 6.b The Main Screen

The first screen you will see is the Main Screen. This is where you will choose what you would like to do with the program. You can return to this screen at any time during your GEE session by selecting from the File menu “Reset the Global Earthquake Explorer.”

Activities in GEE are divided into two categories:

1. “Curiosity-driven” data exploration
2. Structured Learning Modules

Curiosity-driven data exploration describes the top four activities on this main screen (shown in red in **Figure 11**). These require an active internet connection.

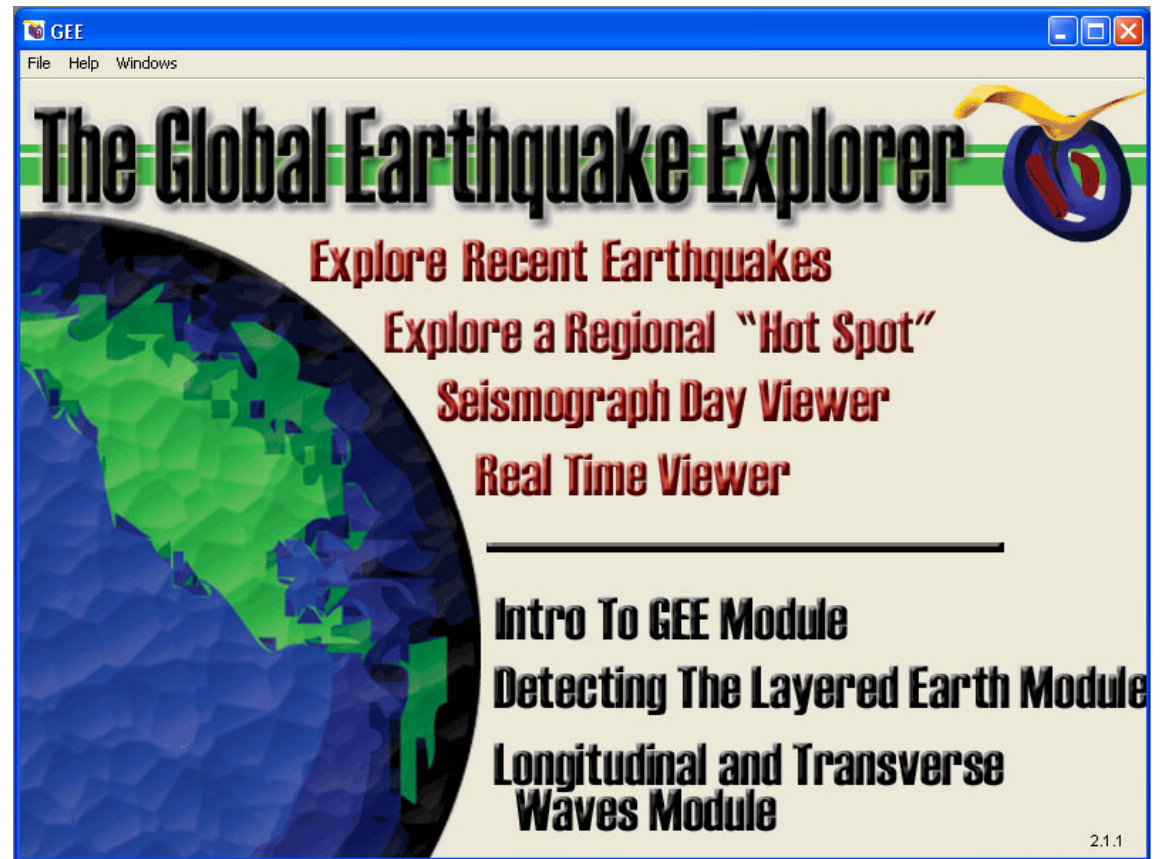
These activities are described as follows:

**Explore Recent Earthquakes:** Access and explore seismograms for recent earthquakes anywhere in the world.

**Explore a Regional “Hot Spot”:** Go directly to a spot in the world known for active seismicity.

**Seismograph Day Viewer:** View an entire day of data from an individual seismograph station.

**Real Time Viewer:** Watch ground motion at seismograph stations anywhere in the world in real-time!



**Figure 11** The Main Screen: Curiosity-Driven Data Exploration

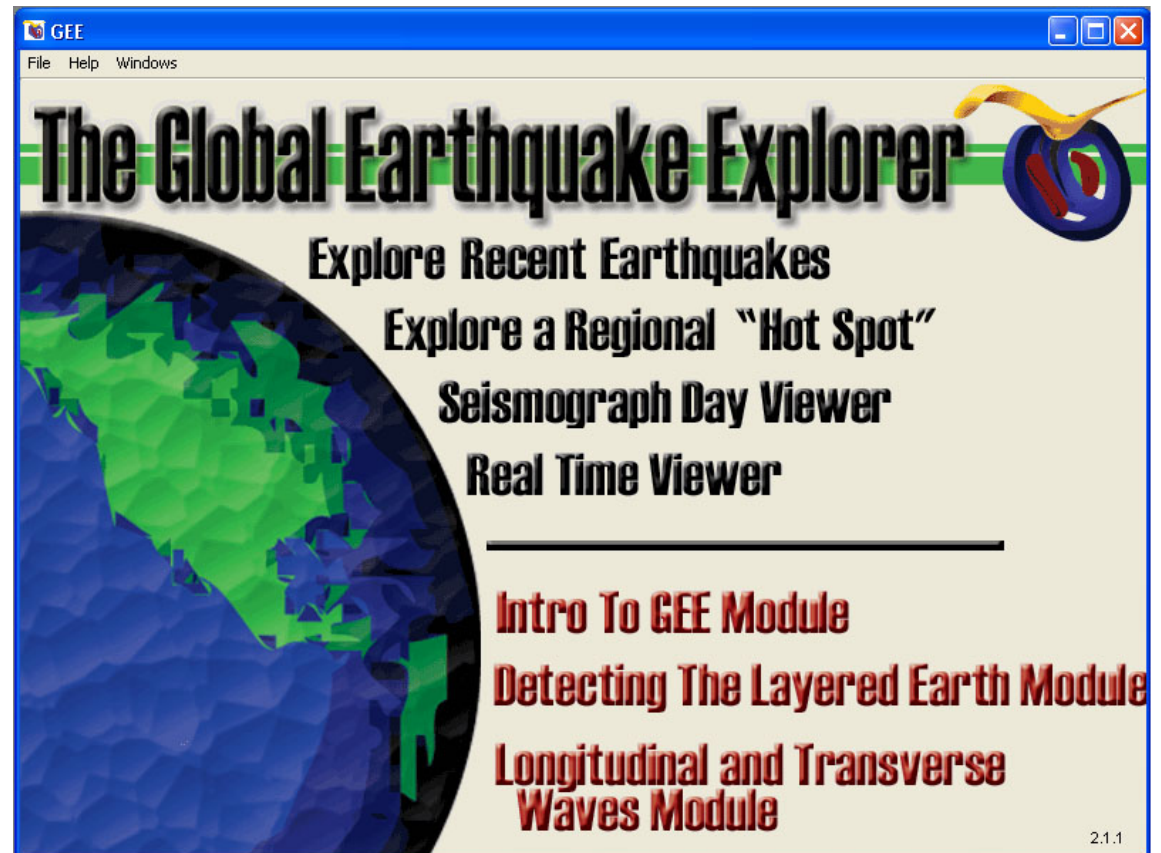
The last three activities on the Main Screen are Structured Learning Modules (shown in red in **Figure 12**), designed to address specific Physical and Earth Science standards. They have been developed and tested in high schools throughout South Carolina as part of the South Carolina Earth Physics Project and are well-suited for a classroom environment. These options do not require an active Internet connection.

These modules are described as follows:

**Intro to GEE Module:** Structured learning module for examining wave properties using a classic earthquake.

**Detecting the Layered Earth Module:** Structured learning module that allows students to discover Earth's structure using a classic earthquake.

**Longitude and Transverse Waves Module:** Structured learning module that explores the difference between P-waves and S-waves using a classic earthquake.



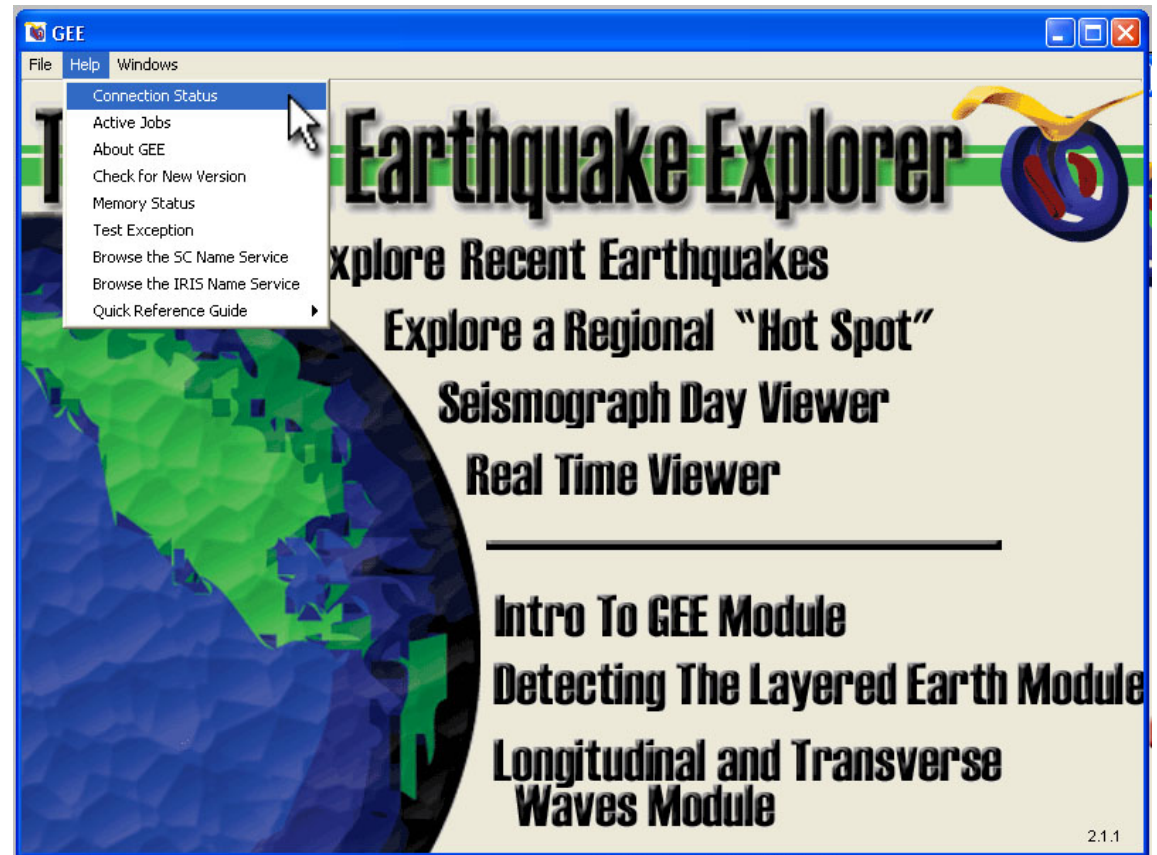
**Figure 12** *The Main Screen: Structured Learning Modules*

### 6.c Internet Connection

An active Internet connection is highly recommended for using GEE. Without one, you will still be able to run the Structured Learning Modules (last three Main Screen items), but you will be unable to access recent earthquakes (first three Main Screen items). To check your Internet connection within GEE, click on the Help menu at the top of the Main Screen and then choose **Connection Status** (demonstrated in **Figure 13**).

If you are experiencing firewall problems, your Connection Status box will look like **Figure 14**. Your system administrator should be able to resolve the problem. Information in **Appendix B** will help him/her make the necessary firewall modifications.

If you are experiencing problems with your local network connection, you will see red dots next to the listed servers as seen in **Figure 15**. This means that your internet connection is currently down.



**Figure 13** Checking Internet Connection Status



**Figure 14** Firewall Problem




**Figure 15** Local Network Problem

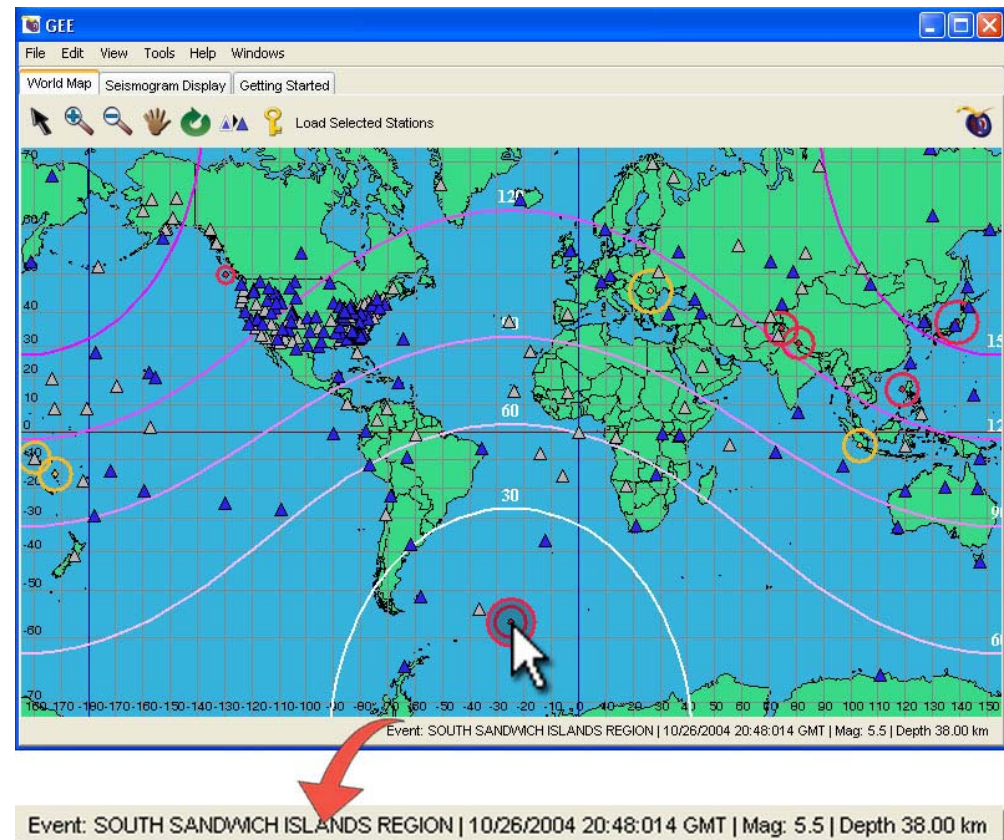


## 6.d Looking at Seismograms

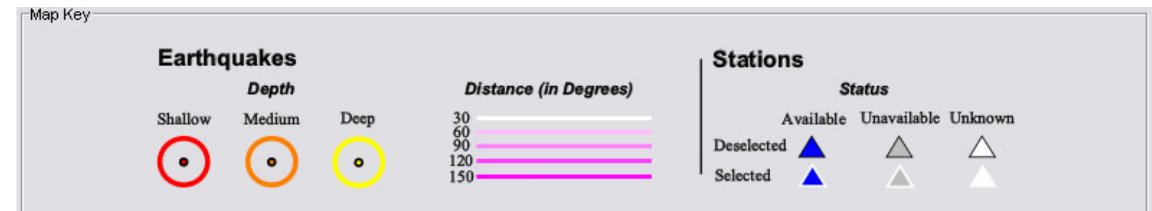
Now we are ready to look at some seismograms! In order to get some seismic information onto the display, open **Explore Recent Earthquakes** from the Main Screen. The locations of all noteworthy earthquakes in the last week are shown as colored circles in the World Map tab. The size of the circle is related to the magnitude of the earthquake. The color of the circle is related to the depth of the earthquake\*. Details about these earthquakes are displayed in the information bar at the bottom of the display when you “roll over” them with your mouse. This feature is shown enlarged in **Figure 16**. The largest earthquake is selected by default. You may select another earthquake with your mouse by clicking within that earthquake’s colored circle. When an earthquake is selected, the purple-shaded lines, circles and arcs on the screen illustrate distances from that earthquake. The distances are given in degrees of arc, which is the common way of measuring distance on a sphere. 30 Degrees is approximately 3,335 km.

\*The Map Key (seen in **Figure 17**) can help you until you have memorized what the colors mean. In order to turn on the Map Key, simply click on

the key icon  at the top of your screen. To turn it off, click it again.

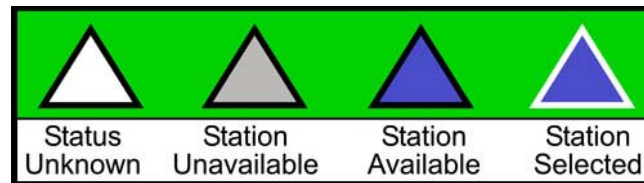


**Figure 16** The Information Bar Shows Earthquake Information When the Mouse Scrolls over the Event Circle

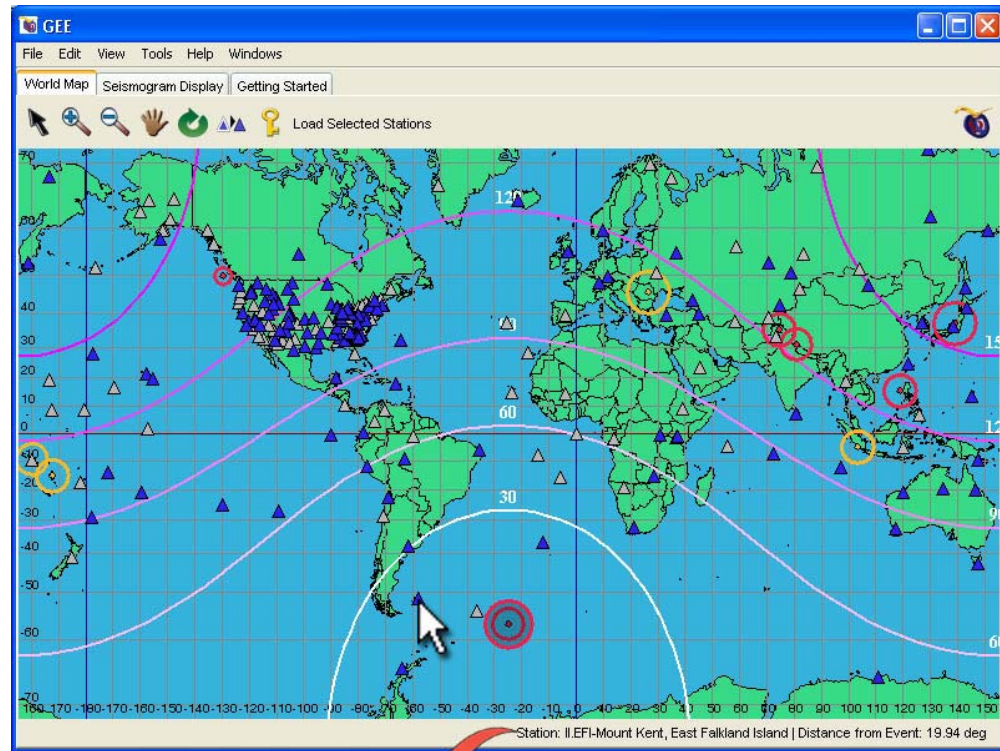


**Figure 17** The Map Key

Seismograph stations around the world are represented by triangles. Blue triangles indicate stations for which data is available for your selected earthquake. Two other types of station triangles may appear on your screen. A grey triangle indicates that this station does not have data available for your selected earthquake. A white triangle indicates that GEE is still trying to determine if data is available for that station. “Rolling over” a triangle provides details about that station in the information line (shown magnified in **Figure 19**). You can request data from blue (available) stations by clicking on them with your mouse. A station selected in this way will appear with a white border around it. When you have clicked the stations you are interested in, click the **Load Selected Stations** button in the toolbar in order to view the seismograms recorded by those stations.



**Figure 18** *Types of Stations*





**Figure 19** *The Station Details are Displayed in the Information Bar*



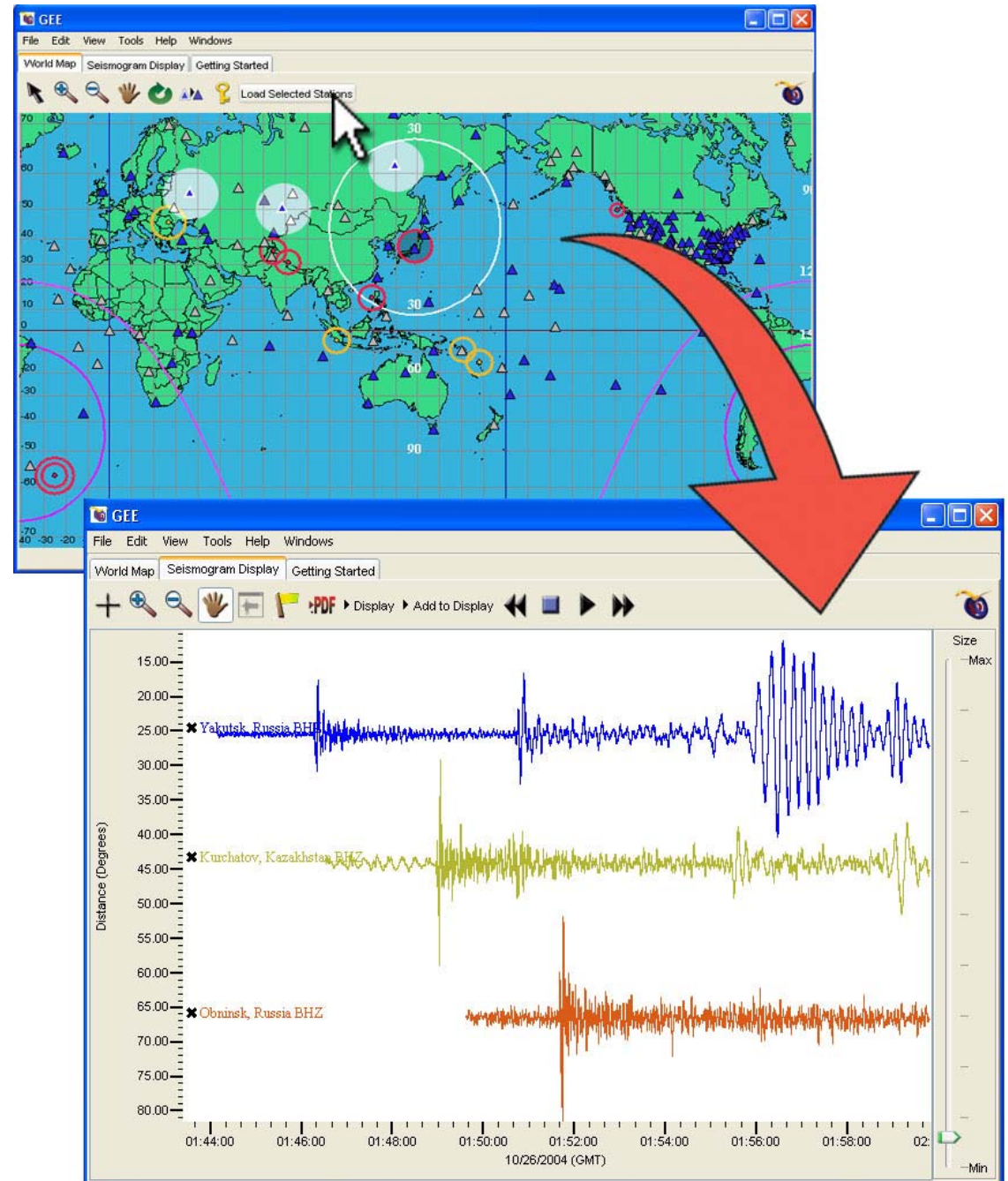
**Figure 20** shows how we get from the Map Screen to the Seismogram Display. Our selected stations are highlighted for emphasis in the illustration. After clicking **Load Selected Stations**, the seismograms (vertical ground motion) will appear in the Seismogram Display tab, arranged by distance, in a format that seismologists call a “record section.”

Record sections are plotted on axes of distance and time from the event. The vertical axis shows the distance of the station from the epicenter of the earthquake, measured in degrees around the earth. The horizontal axis shows the time, measured from the origin time of the earthquake. The increments between the time and degrees depend on the amount that you have zoomed in or zoomed out.

To zoom in, click the zoom in button . To

zoom out, use the zoom out button .

You now have seen the basics of GEE so feel free to play with the buttons and explore. If at any point you feel lost, remember that you can always go to **Reset the Global Earthquake Explorer** from the File menu. The next section covers the buttons along the top of the GEE display, which will assist you in your exploration.



**Figure 20** Getting from the Map Screen to the Seismogram Display



## 6.e Features

This section covers the tools you will use most often while exploring with GEE. First, we will look at the tools you will use while in the Map View. They can be found in the tool-bar at the top of the GEE window (enlarged in **Figure 21**) in the **Explore Recent Earthquakes** section.



**Arrow Cursor:** Use the Arrow Cursor to select or de-select stations and events from the world map.



**Zoom In:** Click on the Zoom In icon and then click on the map anywhere to expand your view of that area.



**Zoom Out:** Click on the Zoom Out icon and click on the map anywhere to reduce your view of that area.



**Hand Tool:** Click on the Hand Tool, then click on the map and hold to move the map by dragging it.



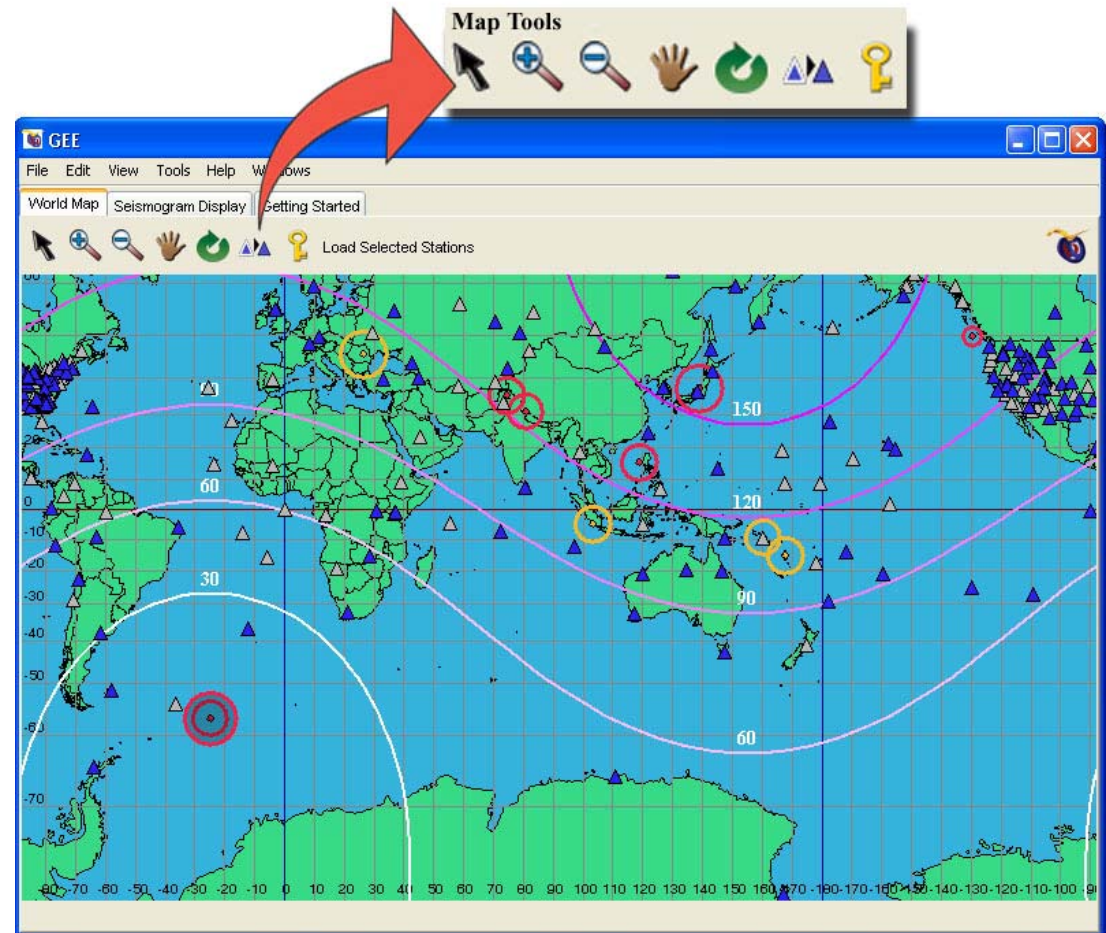
**Reset View:** Clicking this will restore the map zoom to the default and will center the view on your selected event.



**Unselect Stations:** Clicking this will Unselect all selected stations.





**Map Key:** This button will toggle between showing the map key and hiding it (see **Figure 17** for a view of the Map Key).





**Figure 21** Map Screen Tools


Now we will cover the tools that can be found in the Seismogram Display tab. These tools can be seen at the top of **Figure 22**. You will notice that three of the tools are the same ones used in the Map View, but their uses will vary slightly now that we are in the Seismogram Display window.


 **Crosshair:** The Crosshair can be used for multiple tasks. It is described in detail in the following section.


 **Zoom In:** Click on the Zoom In icon and then click anywhere in the seismic display window to get a closer view of the seismograms.

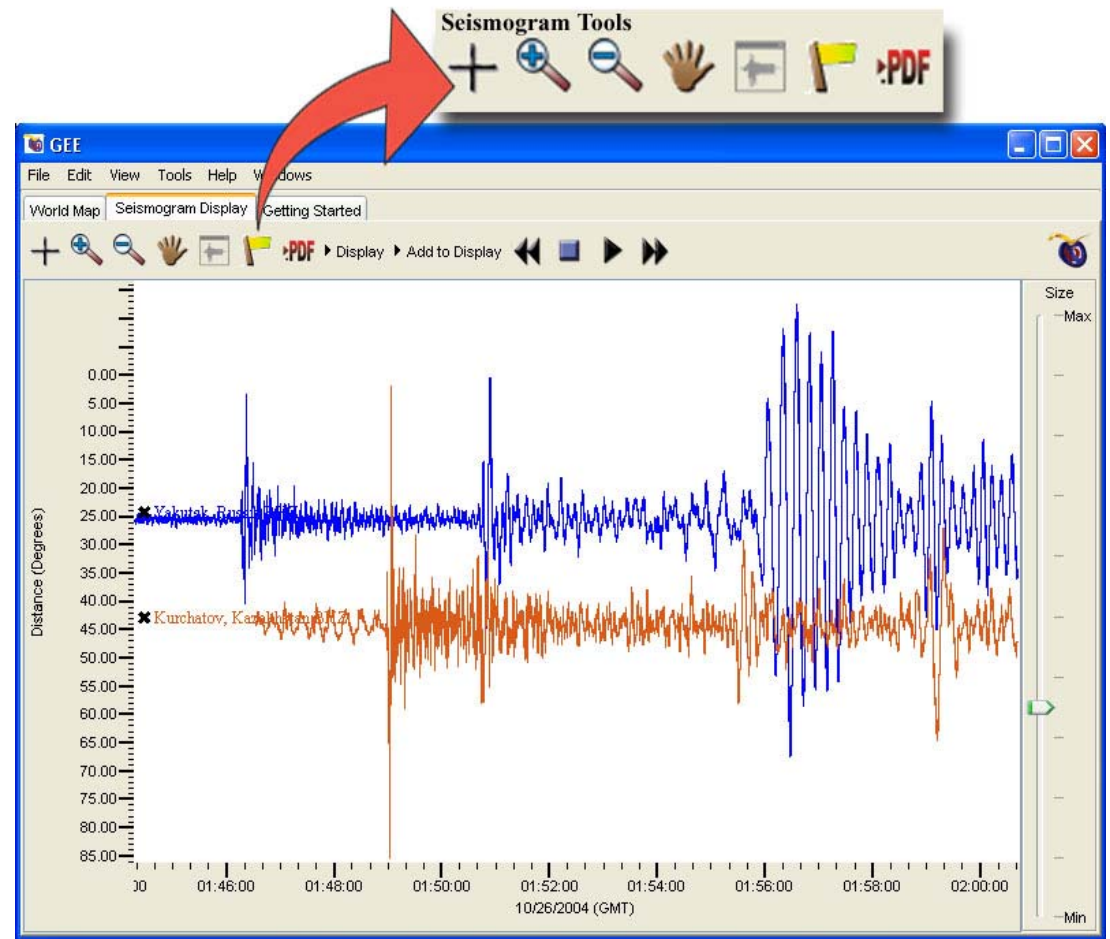
 **Zoom Out:** Click on the Zoom Out icon and then click anywhere in the seismic display window in order to get a more distant view.

 **Hand Tool:** Click on the Hand Tool, then click on the seismic display and hold to move the display by dragging it.

 **Pick Zone:** The Pick Zone will be inactive when you are displaying a Record Section. It will be described later when you learn how to use GEE's other seismogram displays.

 **Flag Tool:** Click the Flag Tool then click on a seismogram in order to mark a special time.

 **Convert to .PDF:** Click the Convert to .PDF button to save your current display as a .PDF file for printing.

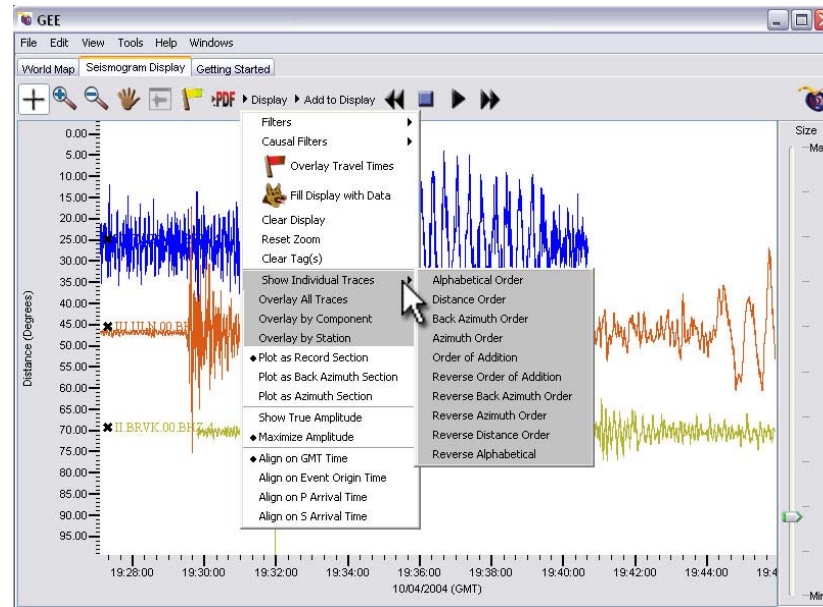


**Figure 22** Seismogram Display Tools

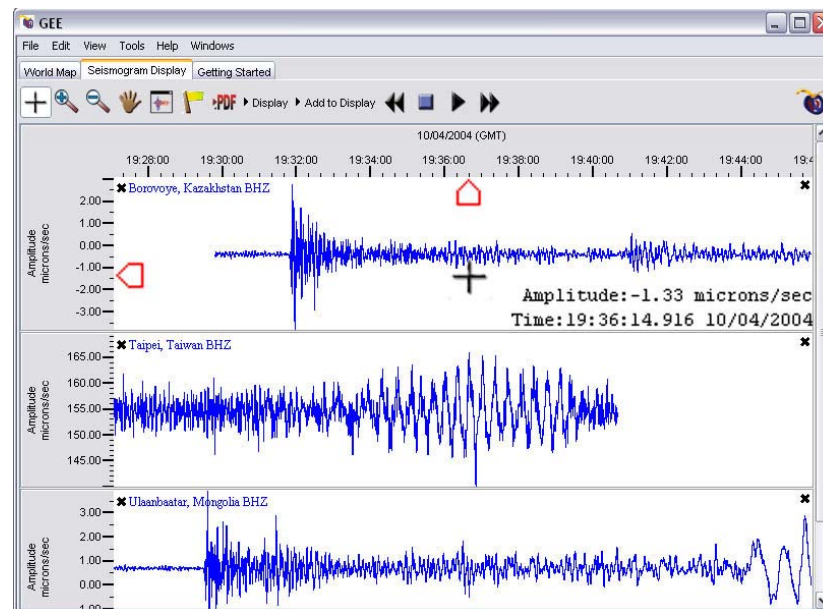


**Crosshair:** The Crosshair tool is useful only for approximation of distance and time from the beginning of the selected event when we are simply viewing a record section in the Seismogram Display tab. However, it can tell us more precise data when we change our display to show individual traces or if we choose to overlay our traces. In order to do this, click the Display tab at the top of the screen. An example of what this will look like can be seen in **Figure 23**. The options shaded light gray in **Figure 23** are the display options for which the Crosshair tool can show exact amplitude and time readings. Now we will see an example of exactly what the Crosshair tool can do in **Figure 24**.

For the purposes of this example, we have chosen to plot our seismograms as individual traces in alphabetical order. This is one of the many display options that will work for the Crosshair tool. Once you have your display set, click the Crosshair tool and place the mouse anywhere within the seismic display. You will see two red pointers and a reading for the Amplitude and Time (both enlarged in **Figure 24** for emphasis). The Crosshair allows you to see the exact amplitude and time for a specific point on the seismogram.



**Figure 23** Display Options and the Crosshair Tool



**Figure 24** Using the Crosshair Tool to Find Amplitude and Time





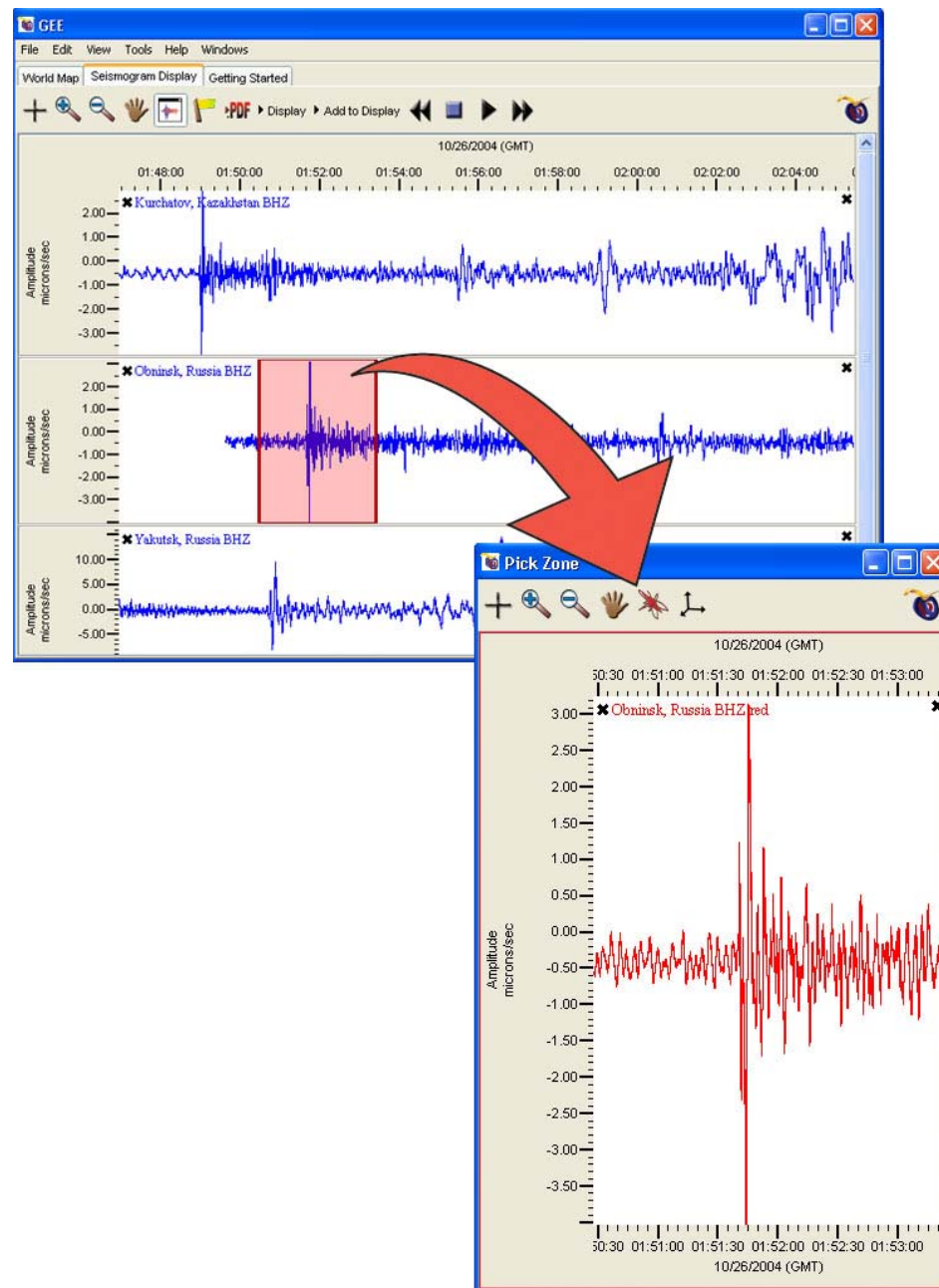
**Pick Zone:** The Pick Zone tool will only work in certain situations. As you can see, in the initial Record Section window, the tool looks like this:



This means that it is not available for use under these conditions. The Pick Zone tool only works under the same display conditions that are optimal for the Crosshair tool, with the seismograms plotted as individual traces or overlaid traces.

The Pick Zone tool is used to extract data so that you can closely examine a portion of a seismogram rather than the entire thing. In order to use the tool, click the **Pick Zone** button, then click on the seismogram from which you want to extract data and drag the extraction window until you are satisfied with your selection. An example of this process can be seen in **Figure 25** where we chose the P-wave of one of our seismograms.

When you release the mouse, a new Pick Zone window will appear (bottom of **Figure 25**), providing you with other tools to examine the data. You can use the **Pick Zone** tool to extract multiple areas on multiple seismic traces. When you do this, the Pick Zone window will expand to include all of your extractions, each in a different color, which will match the extraction window color.



**Figure 25** The Pick Zone Tool in Action

## 7. Exploring with GEE

### 7.a Recent Earthquakes

To view recent earthquakes, select **Explore Recent Earthquakes** from GEE's intro screen. The world map will appear. Your map will look different than these examples due to GEE's dynamic nature. The map will show you all the seismic events from the past week that are considered noteworthy by the United States Geological Survey (USGS). They will be marked with a red, orange, or yellow circle. The largest of these events is automatically selected. If you would like to select a different event, click it and the map will re-center on that event. Next, select several seismograph stations. For the purpose of this manual we have selected a seismic station on the Marianas Islands in Guam and one in Taipei, Taiwan (highlighted in **Figure 26**). Remember, only stations that are blue will have information for the selected earthquake. To view the seismograms from these stations click on the **Load Selected Stations** button in the toolbar.

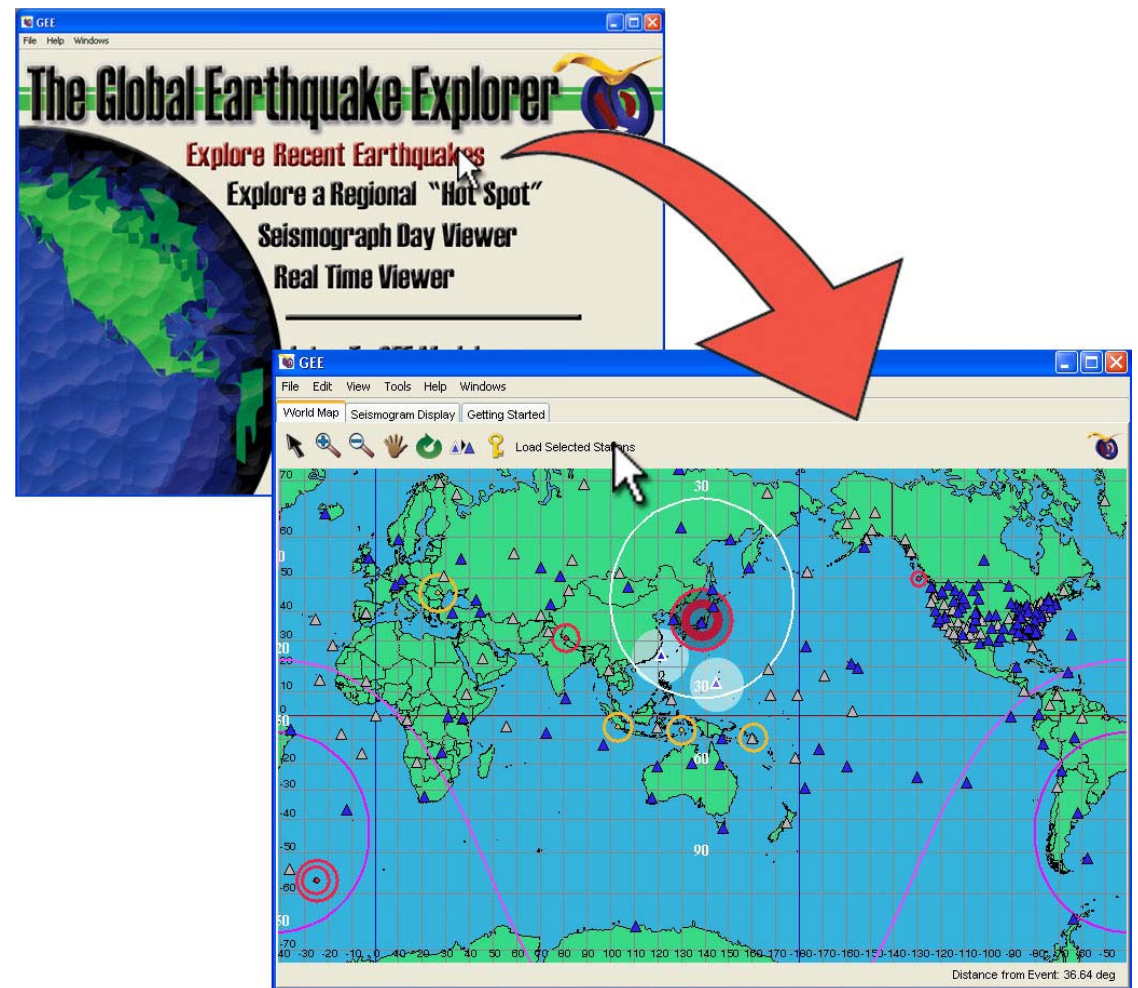
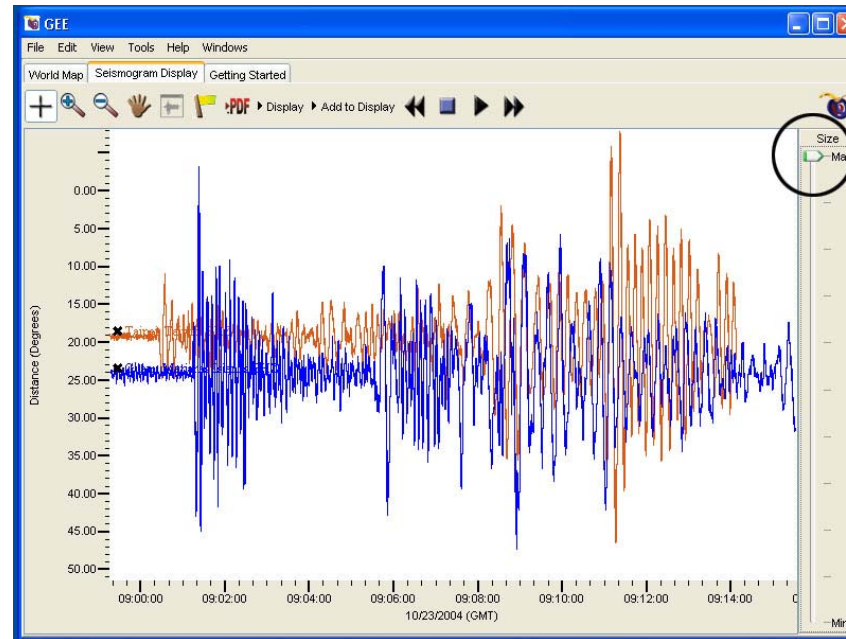
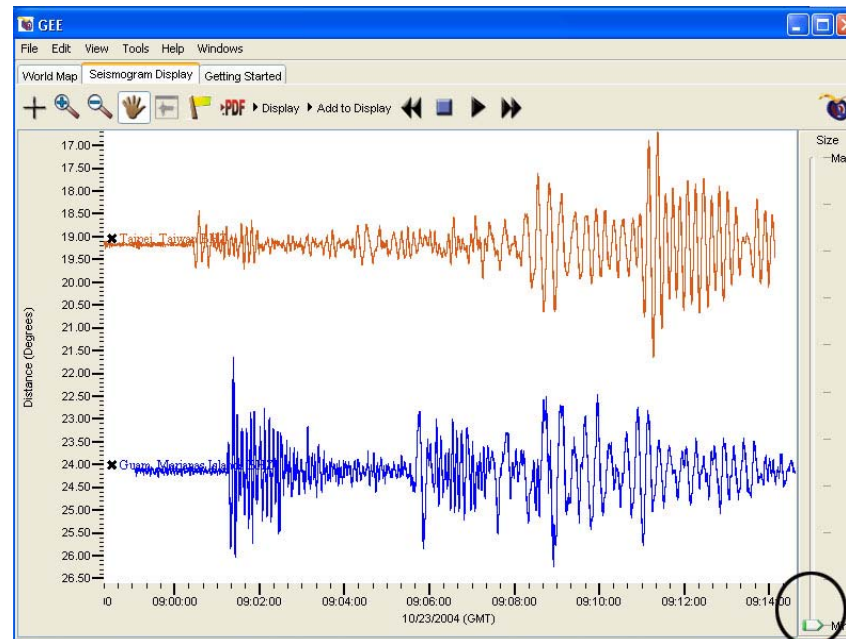


Figure 26 Selecting Stations to View Recent Earthquakes

A seismograph from each selected station will appear in a new tab with a different color assigned to each trace (as in **Figure 27**). In this window you can view the seismic traces in a record section. The slider along the right side of the window will allow you to change the size of the traces. **Figure 27** shows the seismograms at their maximum amplitude while **Figure 28** shows the traces at the minimum amplitude. The amplitude slider is circled in both figures to demonstrate its position relative to the size of the traces. The black “X” next to the name of each seismogram allows you to remove the seismograms one at a time. Simply click on the X and the unwanted seismogram will disappear.



**Figure 27** Seismograms at Maximum Amplitude



**Figure 28** Seismograms at Minimum Amplitude



We will now explore the **Display** menu (Figure 29), which can be found on the toolbar at the top of the Seismogram Display window. We discussed this feature of GEE briefly when we covered the Crosshair and Pick Zone tools. The **Display** menu is a good place to explore, and understanding it will help you to get the most out of your data. It allows you to display the data in different ways, such as overlaying it or splitting it into separate windows.

This menu also allows you to **Overlay Travel Times** which appear as labeled flags for the Origin, the P-wave, and the S-wave for each event.

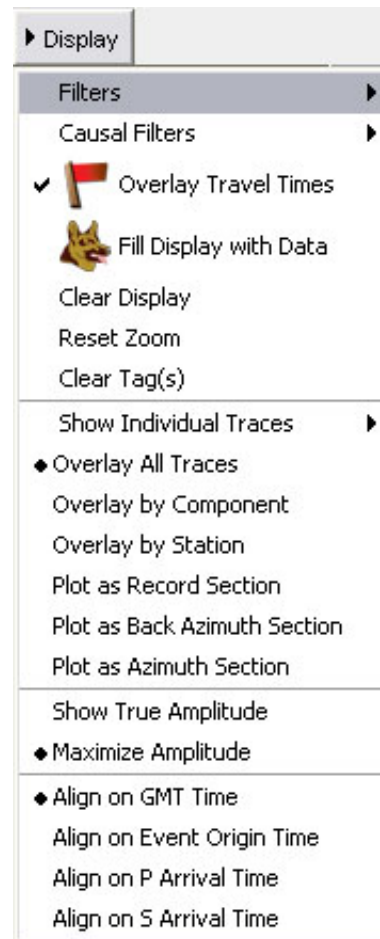
Is the Seismogram trace not reaching the edge of the screen? Click on the **Fill Display with Data** dog and GEE will get enough data to fill the rest of the window.

If at any time you would like to clear the Seismogram Display Window and start over, click **Clear Display**.

If you have done a lot of zooming in or out and would like to return to the original zoom, click **Reset Zoom**.

Remember the Pick Zone tool from before? If you would like to get rid of the extraction windows you placed on the Seismogram Display with this tool, simply click **Clear Tag(s)** and they will be removed.

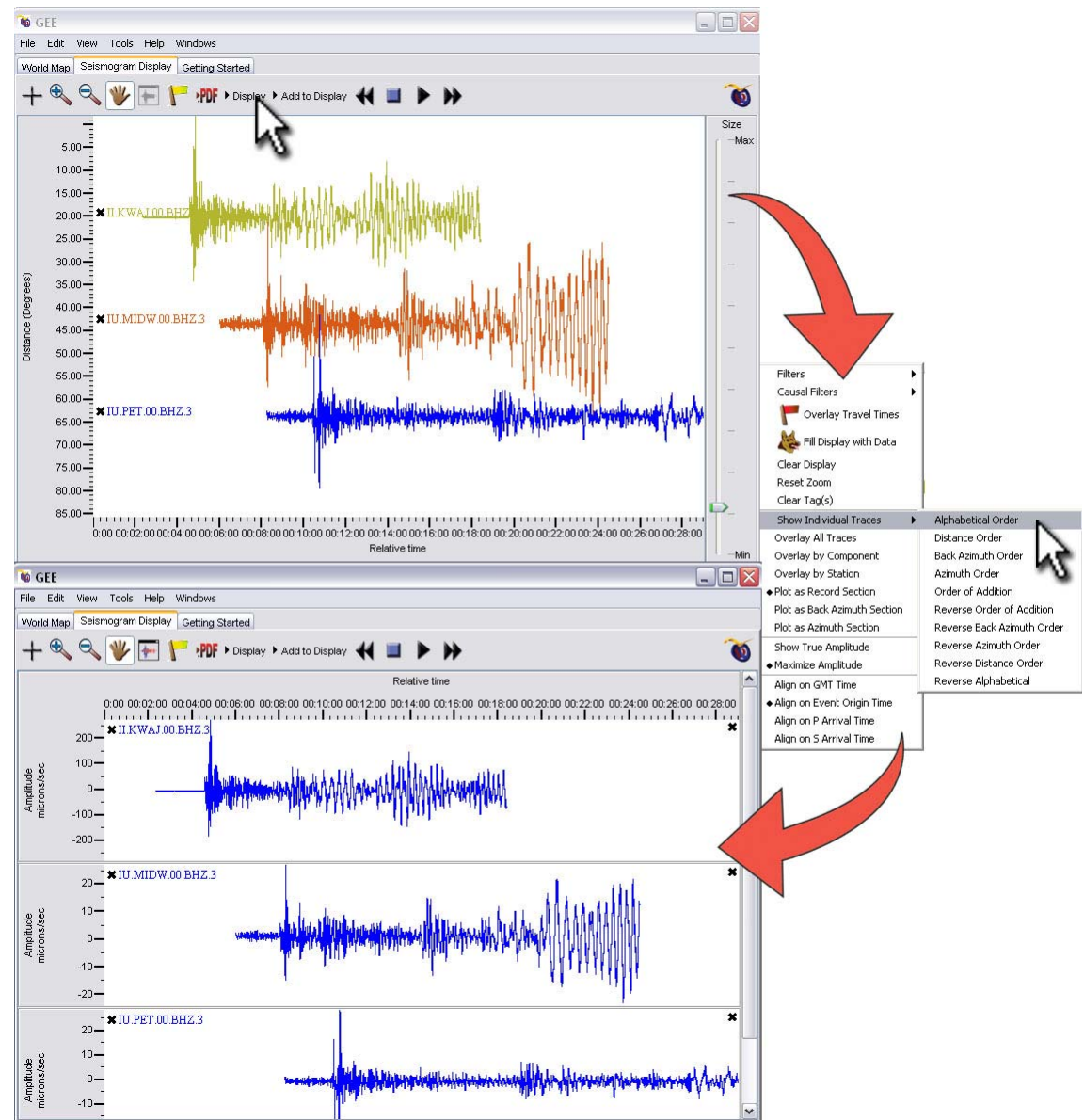
Now we will discuss displaying the seismic data as individual traces.



**Figure 29** *The Display Menu*

In **Figure 30** you can see an illustration of how to get from an initial record section display to showing the seismograms as individual traces plotted in alphabetical order. Once you are in the Seismogram Display window, click on the **Display** menu. Then choose **Show Individual Traces**, then click **Alphabetical Order** and you will see the seismograms plotted individually, arranged alphabetically according to the channel name. There are many options for plotting the seismograms individually including **Distance Order**, which arranges the traces according to the distance of the station from the event.

Another useful set of **Display** features is the overlay options, including **Overlay All Traces**, which will allow you to view the traces on top of each other. We will see an example of what overlaid traces look like in **Figure 31** on the next page, where we will discuss the amplitude **Display** options.



**Figure 30** From Record Section Display to Individual Traces

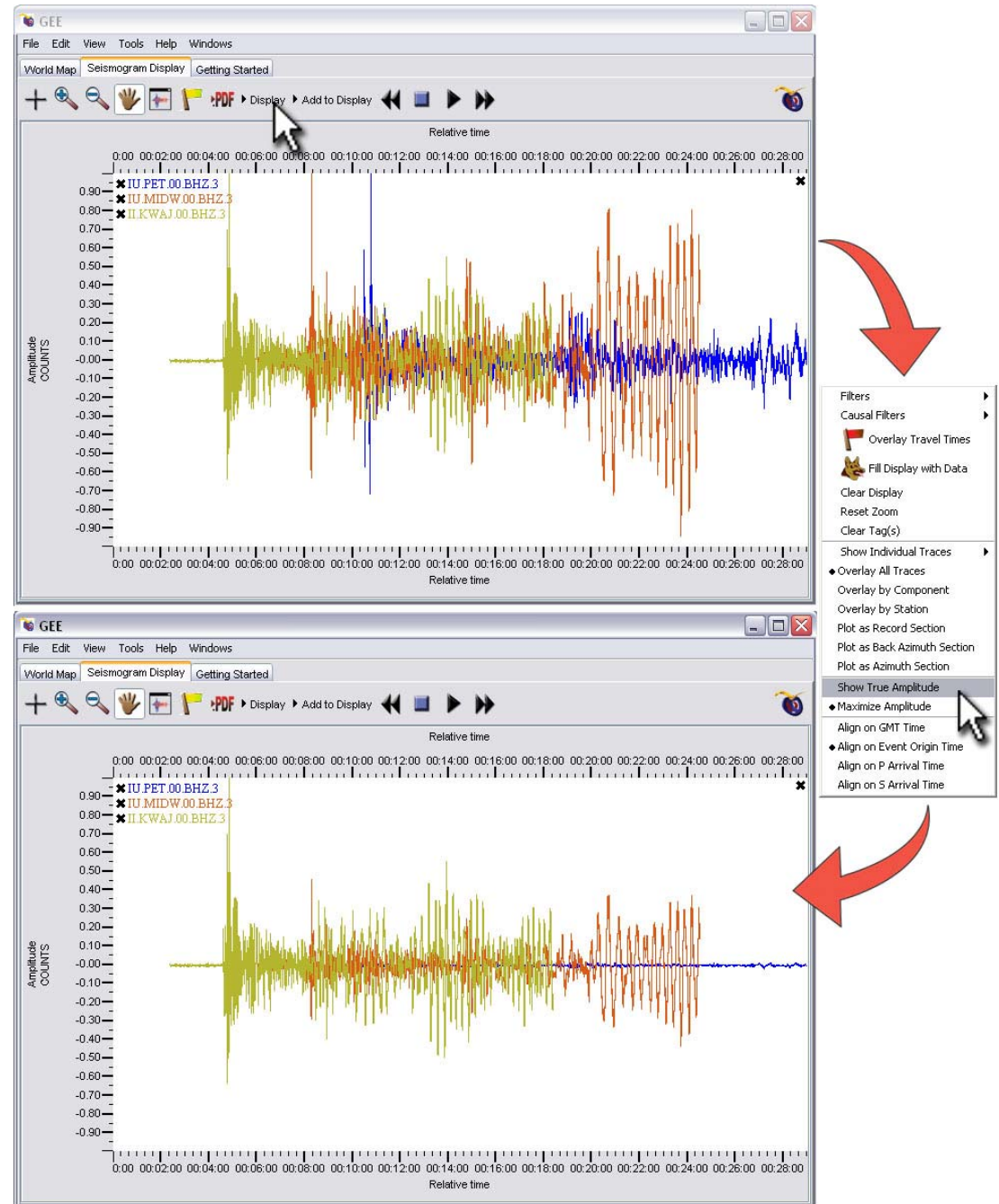
The two Display options available concerning amplitude are **Show True Amplitude** and **Maximize Amplitude**.

**Maximize Amplitude** is the default setting for the Seismic Display. It stretches all the traces to fill their windows vertically. This is useful when you want to see the maximum amount of detail in your traces.

**Show True Amplitude** puts all of the traces on the same scale, allowing comparison between them. In order to display your data in this way, click the **Display** menu, then click **Show True Amplitude**.

At the bottom of the **Display** menu, you will see options for aligning the seismograms according to time. Click on these to align according to GMT, event origin, P-wave arrival, or S-wave arrival time.

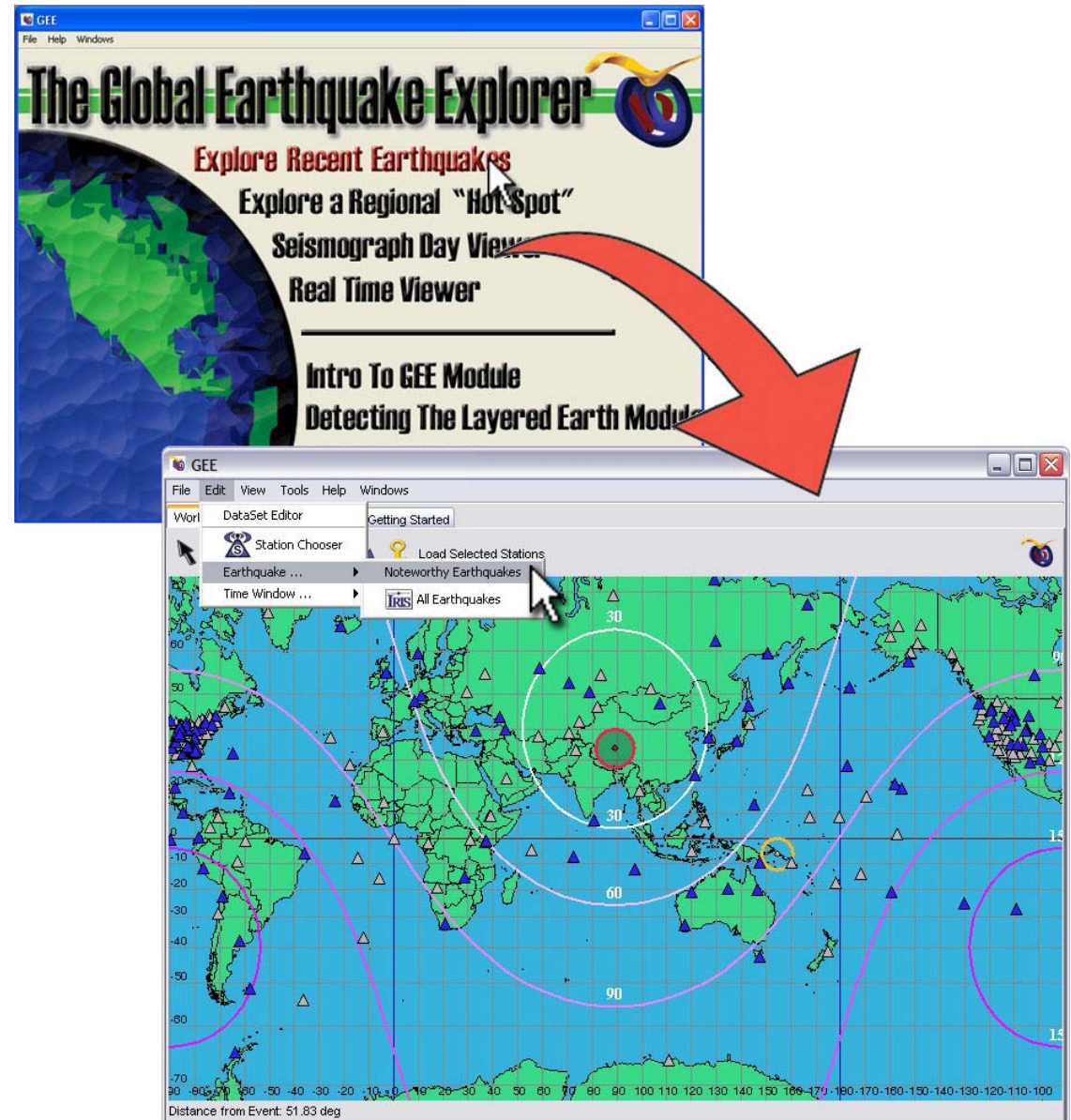
As you can see, the **Display** menu is a good place to explore since there are many options, many of which can be combined. For example, in **Figure 31** we used **Overlay All Traces**, **Show True Amplitude**, and **Align on Event Origin Time** to produce the end result.



**Figure 31** Maximum Amplitude vs. True Amplitude

## 7.b Older Earthquakes


To view older earthquakes, select **Explore Recent Earthquakes** from GEE's intro screen. After the world map appears, select from the **Edit** menu: **Earthquake – Noteworthy Earthquakes** (Figure32).





**Figure 32** How to Find Noteworthy Earthquakes



The Noteworthy Earthquakes window will appear (**Figure 33**). This window allows you to select seismic events based upon when and where they happened. By default, GEE displays earthquakes from the past week. Change this interval by selecting a new beginning time and ending time. GEE has access to databases that go back as far as 1986, but only has data for noteworthy events as far back as 2001. One important thing to note is that you should only use

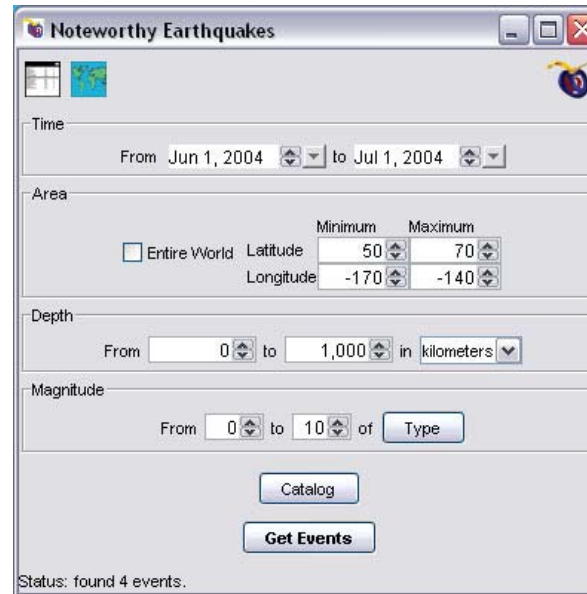
the up/down buttons  next to the date boxes in order to set your desired time range. If you delete the text in the box and enter the date yourself, GEE will not be able to find any events. If you would like to change the specific day, highlight the day number with your mouse and then click up or down

on the up/down buttons . Also, you can use the pull-down calendar, which you can see when you

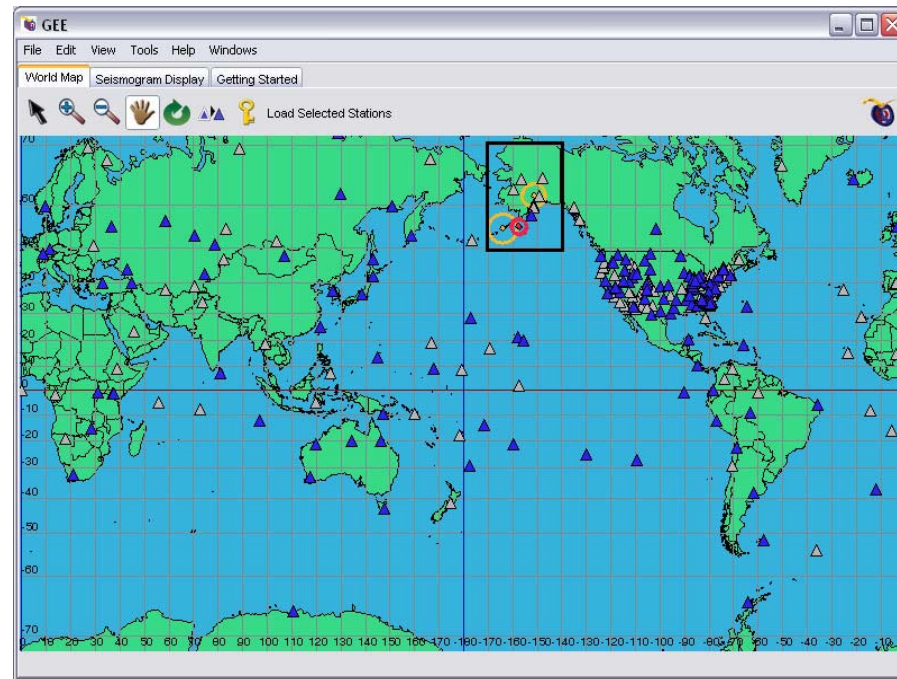
click on the pull-down button  and choose your day, month, and year from there.

You can also choose to limit your results to a certain area of the map. For example, if we only wanted to see seismic events in Alaska, we would pick the values of 50 and 70 as our minimum and maximum Latitudes, and we would pick -170 and -140 as our minimum and maximum Longitudes (south and west have negative values). **Figure 34** has a box around the selected area to show what we have chosen with our latitude and longitude settings (shown in **Figure 33**). The GEE map can be used as a reference to get these Longitude and Latitude measurements. To reset these measurements to get information from the whole world, check the **Entire World** box.

You can also limit your search based on the depth and magnitude of the earthquakes. When you are finished setting the variables, push the **Get Events** button to display the seismic events on the main GEE map.



**Figure 33** The Noteworthy Earthquakes Window



**Figure 34** Events in Alaska from June 2004 to July 2004

### 7.c Regional “Hot Spots”

In order to view a Regional “Hot Spot,” our term for an area that is interesting from a seismological standpoint, simply click **Explore a Regional “Hot Spot”** on the Main Screen (**Figure 35**).

Since earthquake activity is always changing, the “Hot Spots” feature of GEE will also change from time to time, even though you are using the same version of GEE. “Hot Spots” can be added (and deleted) by the GEE support team without you needing to do anything! Figure 35 shows the “Hot Spot” window when Mt. St. Helens was active. After the devastating Indonesia earthquake and tsunami in December, 2004, this region became a “Hot Spot” (this can be seen in **Figure 36**). It will eventually be removed, as will Mt. St. Helens should that activity subside. California is always popular and will be a “standard Hot Spot.” USArray is a large project that will study the continental US over the next decade. This “Hot Spot” is oriented toward that project rather than a region of significant seismicity. Visit [www.earthscope.org](http://www.earthscope.org) for more information.



**Figure 35** Exploring Regional “Hot Spots”



Click the **Explore** button (as in **Figure 36**) associated with the “Hot Spot” in which you are interested to view seismic stations linked with that area. You can also select stations and load them to view seismograms in the same manner you have seen in the **Explore Recent Earthquakes** feature.

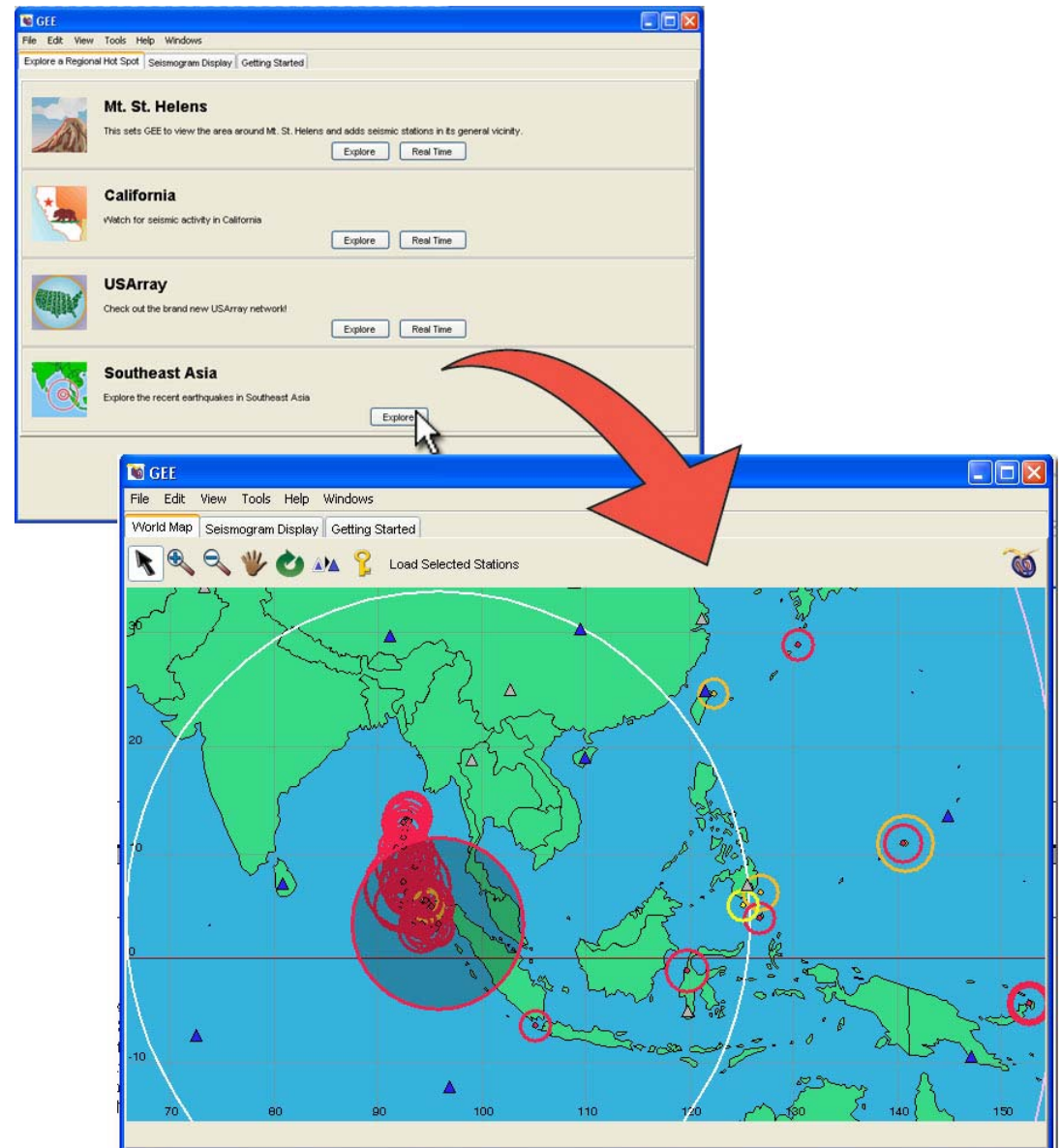
Clicking the **Real Time** button will allow you to select stations and then load them in order to see seismic data stream across your screen in real-time! **Section 7.e** of the manual discusses GEE’s **Real Time Viewer**, which will enhance your understanding of this feature.

An advanced Feature of GEE is the ability to configure your own “Hot Spot” and load it in GEE. Teachers or seismologists may at times make these configurations available to GEE users, either in a local file or via a website. Most users will not be able to use the following two buttons without some “guidance” from a GEE Power User!

Click the **Reconfigure GEE from a File** button in order to load a configuration from your computer.

Click the **Reconfigure GEE from a URL** button to load a configuration from the internet.

To return to the Main Screen from this point, you can always click on **Reset the Global Earthquake Explorer** from the **File** menu or click the **Return to GEE’s Initial Screen** button, which we have added for your convenience.



**Figure 36** Exploring the Southeast Asia “Hot Spot”

#### 7.d The Seismograph Day-Viewer

To get started, click on **Seismograph Day Viewer** on the GEE Main Screen (Remember, you can return to the GEE Main Screen at any time by selecting **Reset the Global Earthquake Explorer** from the **File** menu). Then go to the “**Station Map**” tab and choose one of the stations indicated by a blue triangle. At the time this manual was produced, only seismic stations within the SCEPP (South Carolina Earth Physics Project) were available in the Day Viewer. However, like the “Hot Spot” display, the Day Viewer can be reconfigured remotely. It could be that when you launch GEE, Day Views of global stations will be available!

Selecting a station will switch to the Day Viewer Display and show the vertical ground motion at your selected station for today. If any earthquakes occurred on the day displayed, a list of those events appears on the top of the Day Viewer Display. The origin time of the earthquake (“Origin” flag), and the P- and S-wave arrival times are displayed on the seismogram in the same color as the text of the event. The Amplitude slider along the top of this screen will change how large the trace appears, and the Spacing slider will change how far apart the traces are drawn.

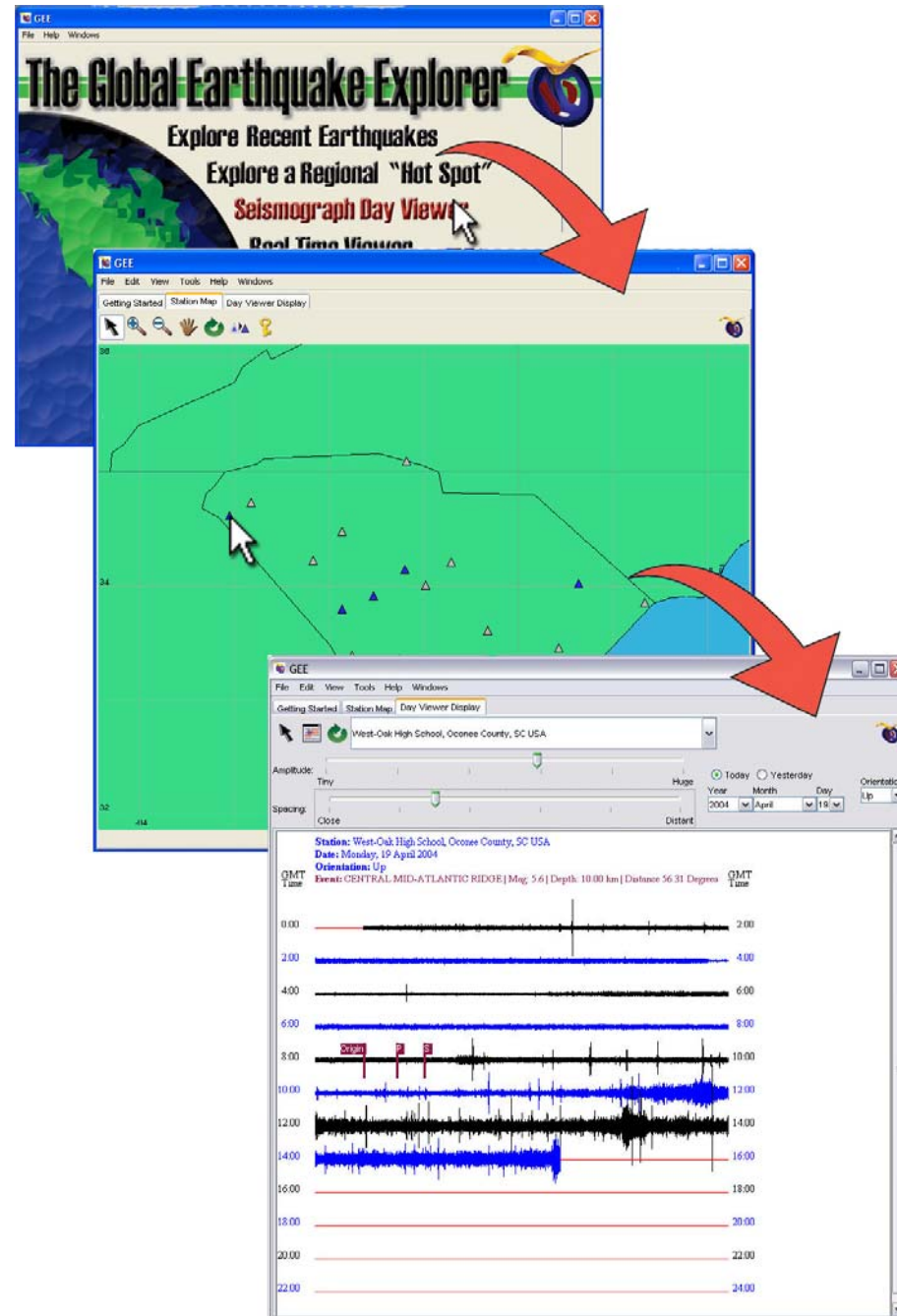


Figure 37 Using the Seismograph Day Viewer

“Rolling over” the earthquake name at the top of the display will cause a red extraction window to appear (seen in **Figure 38**). Clicking on the earthquake name will lock the extraction window into the display. You can then adjust the size of the window with your cursor. Next, click the **Extract** button. This will cause that portion of the seismogram to appear in a new **Seismogram Display Tab** (**Figure 39**).

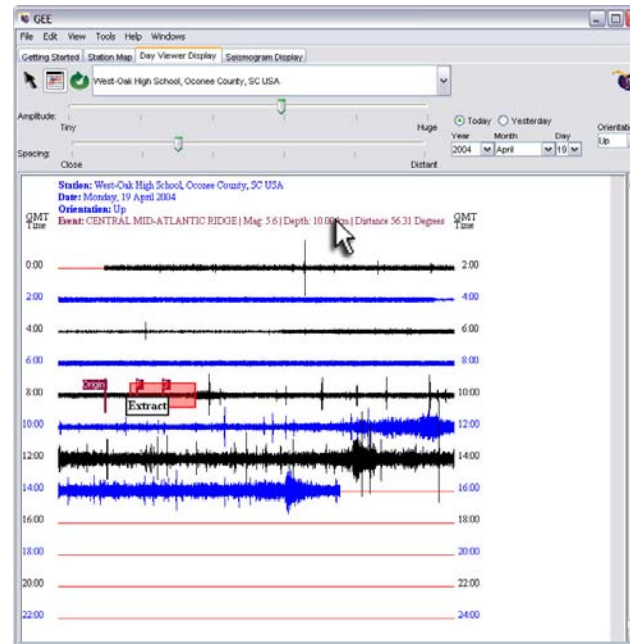
You can more closely examine any portion of the seismic display by clicking the **Select Data** button at the top of the screen.



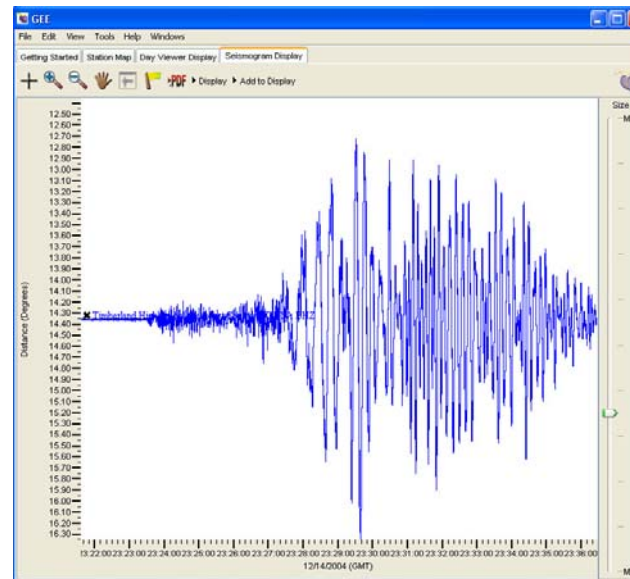
- You may adjust the date, ground motion orientation, and display scales using the tools at the top of the Day Viewer Display. However, if you wish to view another station's data, you must return to the Station Map and select that station.
- You may also switch among selected stations from the list at the top of the display. When changing date, station, or orientation, you must click the refresh button from the toolbar after you have set your variables.



- If you leave the Day Viewer active, it will update itself every 15 minutes.



**Figure 38** *Extracting Data*



**Figure 39** *Extraction Data in a New Window*



## 7.e The Real-Time Viewer

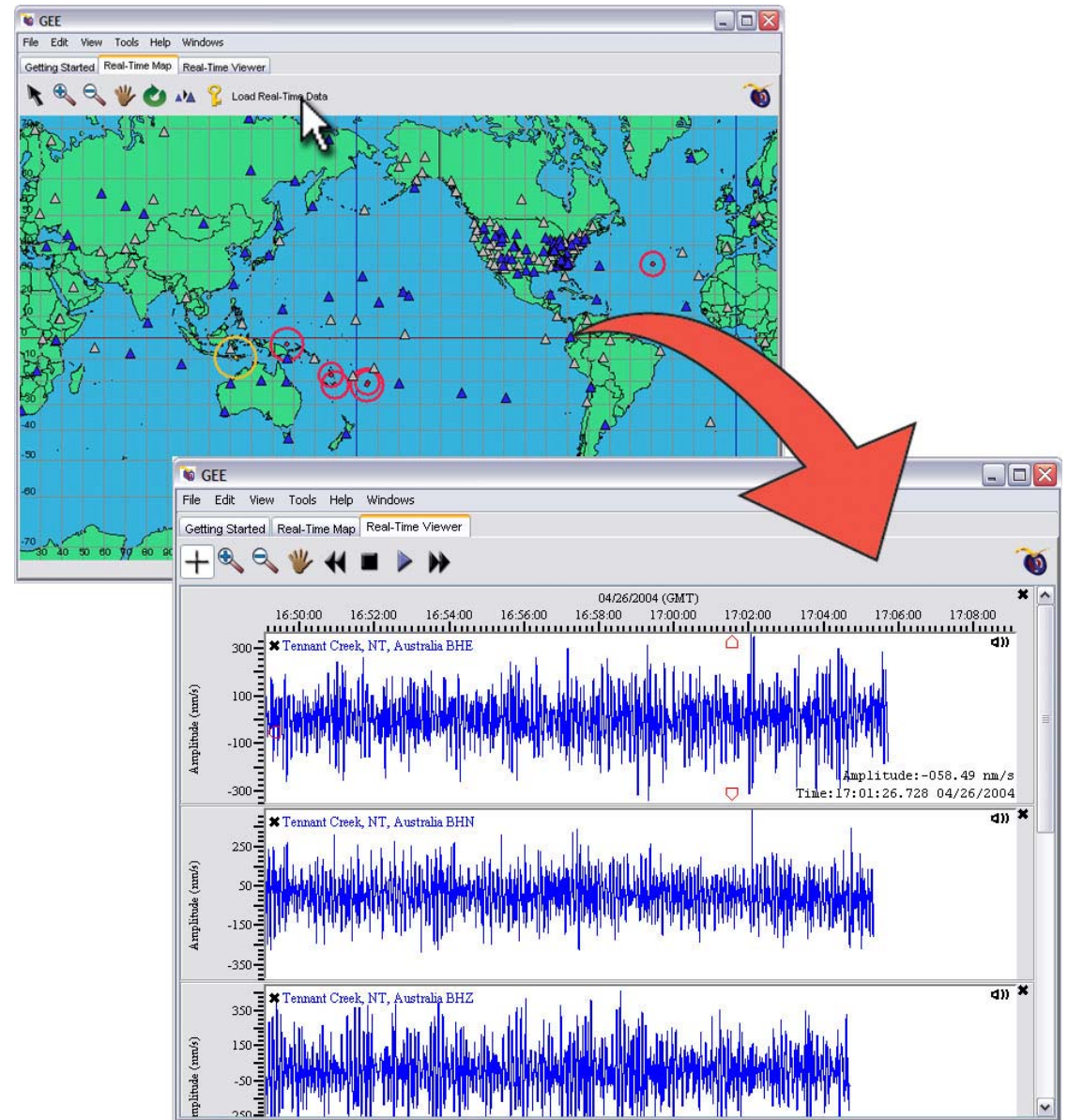
To get started, select **Real-Time Viewer** from the GEE intro screen. Then go to the “Real-Time Map” tab and choose a few blue triangle stations. Once you have chosen your stations, click the “Load Real-Time Data” button (seen in **Figure 40**) and GEE will take you to the Real-Time Viewer.

It may take several seconds for the first data to arrive, but once it does, it will scroll across your screen in real-time.

You will see three seismic traces for each station you have selected. Each trace shows the ground motion oriented in a different direction. One is east (BHE), one north (BHN), and one up (BHZ).



- Depending on the memory of your computer, this feature may appear jerky if too many stations are selected.
- Use the play controls at the top of the screen to speed up, slow down, or stop the seismogram, much in the same way you would control a VCR.
- Data typically comes from stations in packets between 30 seconds and 2 minutes in length.



**Figure 40** Exploring the Real-Time Viewer

## 7.f Importing Other Data

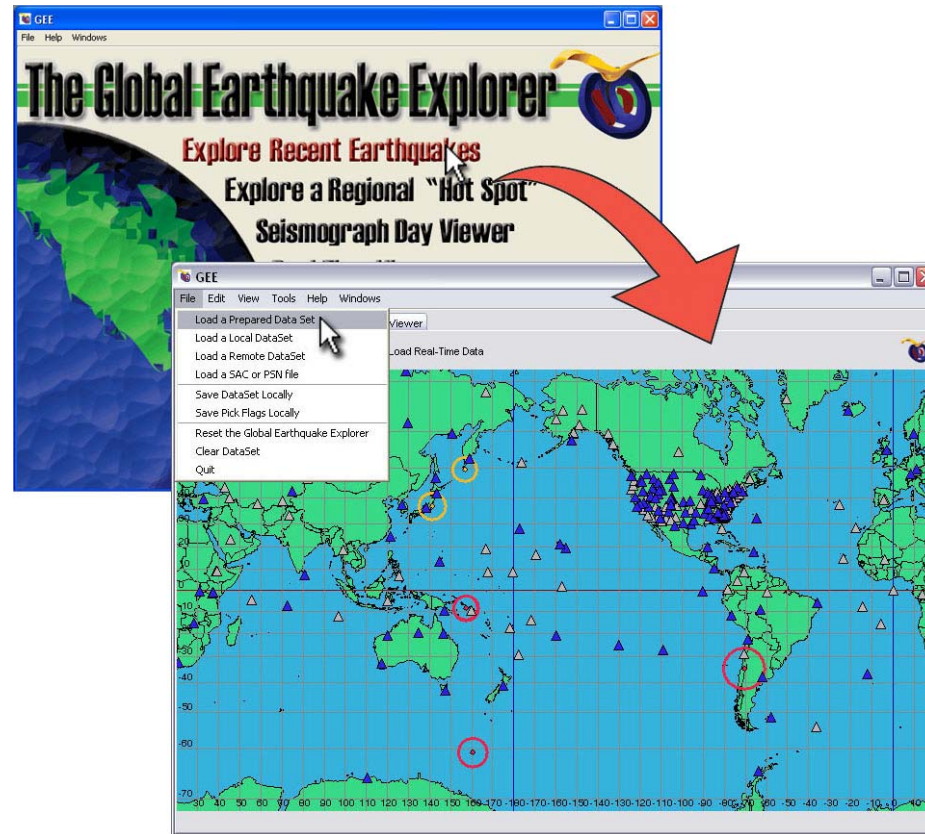
Sometimes seismologists record interesting seismic data that they have found in order to demonstrate important geological principles. This data is often used for educational purposes. GEE, as we have seen, can be used to gather new and current data, but it can also be used to view and explore classic seismic data.

First, choose **Explore Recent Earthquakes** from the Main Screen. Then, click on **Load a Prepared Data Set** (refer to **Figure 41**) from the File menu in order to select a file from the SCEPP Earthquake Repository.

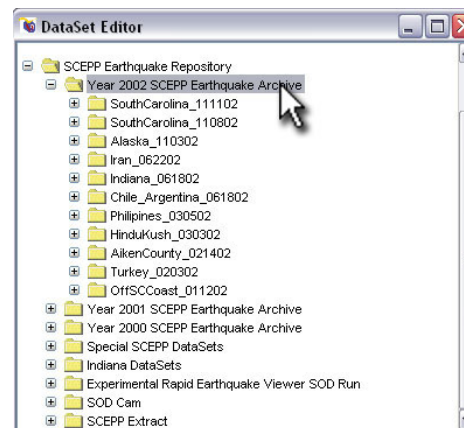
From this window (**Figure 42**), you can select data from the folders, which are labeled based on location and event times.

In order to open data files (.dsml format) that have been saved on your computer, select **Load a Local Data Set** from the File menu

To view data from an internet source, select **Load a Remote Data Set** from the File menu and type in the appropriate URL.

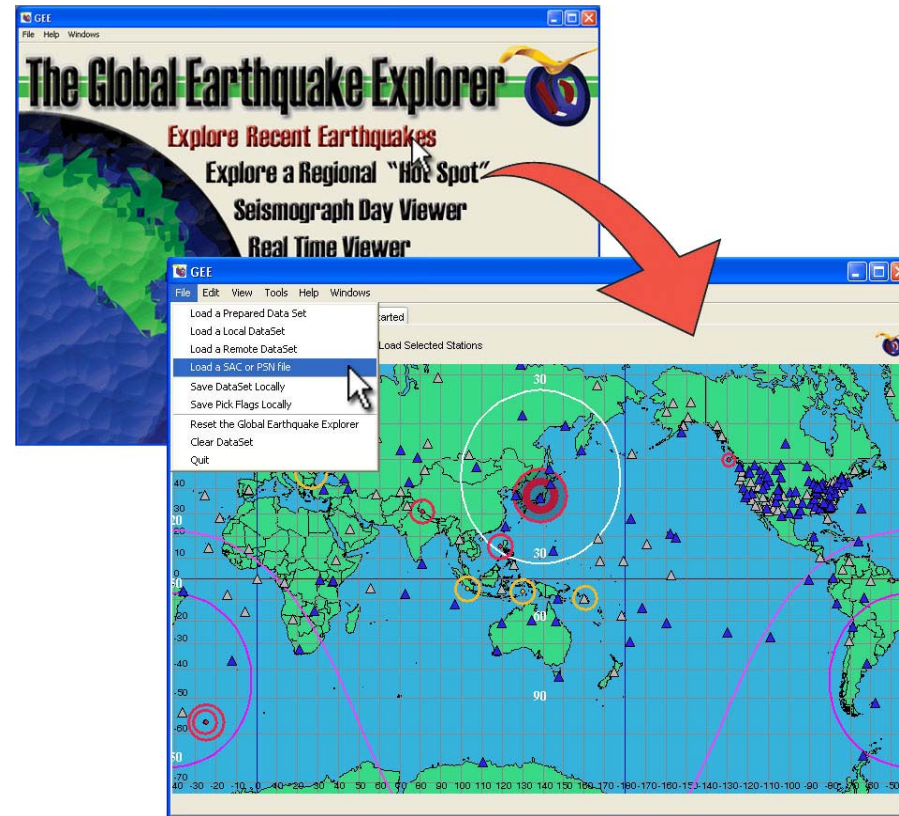


**Figure 41** Importing Data: A Prepared Data Set



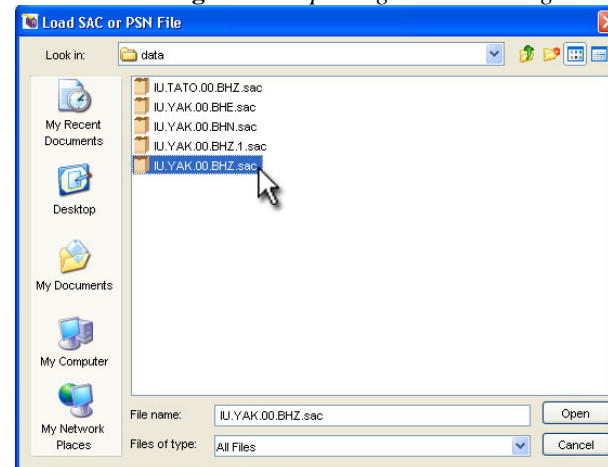
**Figure 42** Loading a Prepared Data Set

To **Load a SAC or PSN file** from your computer, select this option from the File menu (seen in **Figure 43**). GEE will then allow you to search through the files in your computer.



**Figure 43** *Importing Data: Loading a SAC or PSN File*

Once you have found the appropriate file, double click on it (**Figure 44**) and the data will appear in the seismogram display window.



**Figure 44** *Choosing a SAC file to Load*



## 8. Structured Learning Modules in GEE

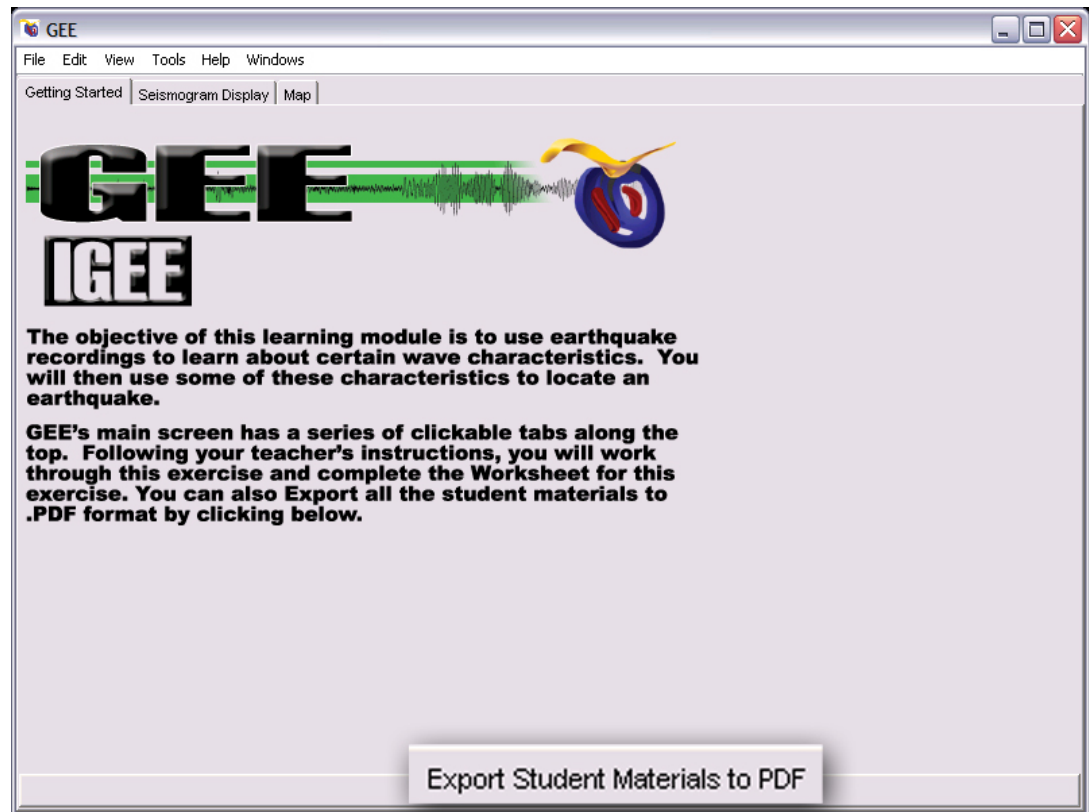
Three Structured Learning modules have been included with all distributions of GEE. These modules allow you to use GEE in a closely guided environment with step-by-step instructions. These exercises are intended for a classroom setting or for first-time GEE users. To start a module, click on it in the Main Screen. A brief explanation will appear telling you what will be learned in this module along with a button (enlarged in **Figure 45**) to export detailed instructions and resources to your hard drive. These resources will be in the form of PDF (Portable Document Format) files, which can be viewed and printed with the Adobe Reader or any Adobe Acrobat program. If you do not already have a version of Adobe Reader or Acrobat on your computer, you can easily download it for free from [www.adobe.com/products/acrobat](http://www.adobe.com/products/acrobat). The GEE teaching material (also PDF documents) is available once you have started each of the GEE learning modules. Click on the **Help** menu and select “**Save Teacher Materials.**”

The three Structured Learning modules are:

**Intro to GEE Module:** In this exercise you will use a classic earthquake to learn about seismic wave characteristics.

**Detecting the Layered Earth Module:** You will use a classic earthquake to learn about the earth’s structure based on variations in P-wave arrival time.

**Longitude and Transverse Waves Module:** Learn the differences between longitudinal and transverse waves by examining the P-waves and S-waves of a classic earthquake.



**Figure 45** *The Intro to GEE Structured Learning Module*

## 9. Appendix A: Installation Issues

### 9a. What is this Appendix?

This Appendix will help you with any issues you may be having while installing the Global Earthquake Explorer.

### 9b. Other Operating Systems

So you don't have Windows on the computer you want to run GEE on? Not a problem. GEE can be installed on any Mac OSX computer as well as any Linux distribution with a Graphical User Interface.

#### 9b.1 Mac Installation

##### System Requirements:

OSX 10.2(Jaguar) required, OSX 10.3(Panther)  
recommended  
G3 Processor or better  
32Megs of RAM  
25Megs free Hard Drive space

1. Visit [www.seis.sc.edu/gee](http://www.seis.sc.edu/gee) to download the installer, or send an email to [geebugs@seis.sc.edu](mailto:geebugs@seis.sc.edu) to receive GEE via CD-ROM.
2. Click on the "downloads" button in the upper right hand corner of the page.
3. Choose the Mac OSX version by clicking "self-mounting disk image (18MB)."
4. Once you have downloaded the Self-mounting disk image, double click on the **GEE.dmg.gz** to unzip.
5. Drag the GEE program to your Applications Folder.
6. Double click on the box icon and follow the directions.

#### 9b.2 Linux/Unix Installation

##### System Requirements:

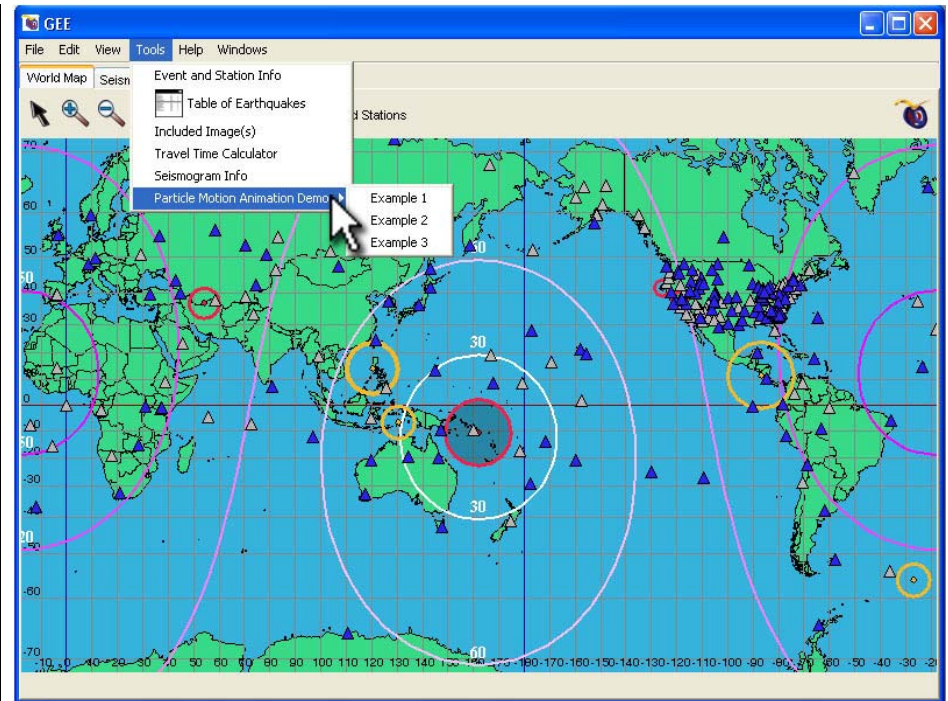
X-Windows GUI capable of running Java  
200 MHz Processor  
32Megs of Ram  
25Megs free Hard Drive space

1. Visit [www.seis.sc.edu/gee](http://www.seis.sc.edu/gee) to download the installer, or send an email to [geebugs@seis.sc.edu](mailto:geebugs@seis.sc.edu) to receive GEE via CD-ROM.
2. Click on the "downloads" button in the upper right hand corner of the page.
3. Choose the Unix/Linux version by clicking "tar.gz (20MB)."
4. Move the **GEE.tar.gz** file to the destination directory  
`<GEE DIR>`  
`mv GEE.tar.gz <GEE DIR>`
5. Change directory to the directory containing the **GEE.tar.gz**.  
`cd <GEE DIR>`
6. Un-zip the file using the tar command.  
`tar -xzf GEE.tar.gz`
7. Run GEE by executing the **GEE.sh** inside the GEE folder.

### 9c. DirectX

DirectX is a software package available for the Windows operating system from Microsoft. The Global Earthquake Explorer uses DirectX to render the Particle Motion Animation Demo. If you find that installing DirectX on your system is inconveniently difficult, you may skip it. The vast majority of The Global Earthquake Explorer will function properly but be aware that the Particle Motion Animation Demo will be inaccessible to you. You can locate this feature by choosing **Explore Recent Earthquakes** from the Main Screen, then select **Tools** and click **Particle Motion Animation Demo** (refer to **Figure 46**).

1. Go to [www.microsoft.com/directx](http://www.microsoft.com/directx).
2. Within the "Quick Links" section select "DirectX9.0b Runtime."
3. Click the download button, and save this file to your desktop.
4. On your desktop, double click the DXwebSetup, and accept the User Agreement.
5. Follow the on-screen directions to finish installing DirectX.
6. Once the installation is complete, DirectX will restart your computer.



**Figure 46** Particle Motion Animation Location

## 10. Appendix B: Internet Issues

### 10a. What is this Appendix?

This Appendix will help you with any issues you may be having concerning your internet connection and the Global Earthquake Explorer.

### 10b. Basic Internet Concerns

GEE uses the internet to access several databases of seismic information. Without an internet connection several parts of GEE will not function. The Learning Modules, however, were designed to be used without an active internet connection. For the rest of GEE, a high-speed internet connection will greatly enhance your experience. If you have a dial-up connection you should be wary of loading huge amounts of data. Selecting shorter time periods and fewer stations at a time will allow you to make the most of your connection.

### 10c.1 Working with your System Administrator

Like most System Administrators, yours is probably over-worked and under-paid. As such, we will try to make his/her job easier. Step-by-step installation instructions are included in the main body of this manual. These directions are written for the beginning computer user and should answer most of your installation questions.

### 10c.2 Firewalls

Running GEE on school computers might cause a few issues. Often, a system administrator will set up a firewall to prevent illegal entry into your school's system. This is a good thing, but it sometimes errs on the side of caution, and may prevent GEE from making outbound connections to our servers. If you open GEE and go to **Explore Recent Earthquakes** and the map appears blank with no station triangles or event circles, you might be having firewall issues.

To check if this is the case, click on the **Help** menu and choose **Connection Status** (see **Figures 13-15**). A small window will pop up with green and red lights, telling you what is active and what is inactive. If all the lights are red, you are not connected to the internet. If the first light is red and the other two are green, you are probably having a firewall issue. Your system administrator will need to open the ports used by GEE. Ask him/her to go to:

**www.seis.sc.edu/wily/Check** and open up the ports used by IRIS and SCEPP (seen in **Figure 47** with the ports column highlighted for reference).



Connection Type	Connection Description	Ping	Query	Address	Port	Time
HTTP	IRIS DMC			http://www.iris.edu	80	190
HTTP	University of South Carolina			http://www.sc.edu	80	112
HTTP	Google			http://www.google.com	80	110
HTTP	UC-Berkeley			http://www.berkeley.edu	80	171
CORBA	IRIS nameserver			128.95.166.129	6371	-1
CORBA	SCEPP nameserver			129.252.35.24	6371	-1
CORBA	Berkeley nameserver			128.32.149.190	1050	-1
EventDC	IRIS EventDC			128.95.166.129	6382	2591
EventDC	Berkeley BDSN EventDC			128.32.149.190	15000	10245
EventDC	Berkeley NCSN EventDC			128.32.149.190	16000	19617
EventDC	SCEPP EventDC			129.252.35.24	6374	3154
NetworkDC	IRIS NetworkDC			128.95.166.129	6381	2045
NetworkDC	Berkeley NetworkDC			128.32.149.190	17000	3203
NetworkDC	SCEPP NetworkDC			129.252.35.24	6373	665
SeismogramDC	IRIS BUD SeismogramDC			128.95.166.130	17506	4650
SeismogramDC	Berkeley SeismogramDC			128.32.149.190	18000	3046
SeismogramDC	SCEPP SeismogramDC			129.252.35.24	6372	4796
SeismogramDC	IRIS Pond SeismogramDC			128.95.166.129	17607	1409
SeismogramDC	IRIS Archive SeismogramDC			128.95.166.129	17605	1423

**Figure 47** [www.seis.sc.edu/wily/Check](http://www.seis.sc.edu/wily/Check) Showing Ports Location



## 11. Quick Reference Guide

You can view the **Quick Reference Guide** within the program or print it out by following a few simple steps. First, choose **Explore Recent Earthquakes** on the Main Screen. Once you are no longer on the Main Screen, choose **Help** from the top menu. You should then see **Quick Reference Guide** near the bottom of the menu. When you let the mouse hover over this option, you will see that you can either **View on Screen** or **Export to PDF File** for printing.

# **GEE** **QUICK REFERENCE GUIDE**



**Crosshair** - Click on this button in order to see the time and amplitude under the crosshair.



**Magnifying Glasses** - Click on these buttons and then click on the display to zoom in or out.



**Hand Tool** - Click on this button and then drag in order to move the display.



**Arrow Pointer** - this tool allows you to select stations and events on the world map.



**Reset** - Click here to reset the Gee display window you are currently viewing.



**Key** - Click here to show/hide the map legend.



**Deselect all Stations** - Click here to quickly deselect all stations.



**Add Friends** - Click here to show the other traces from the same station.



**Tag-Pick** - Clicking here will allow you to select sections of a seismogram trace.



**Play Controls** - Clicking these will effect a seismogram trace in the same way they control a VCR.



For use with: The Global Earthquake Explorer  
A Software Product of the South Carolina Earth Physics Project  
USC Department of Geological Sciences  
The Global Earthquake Explorer uses the IRIS/GEOS framework developed  
under funding from participating operational institutions for seismology (IRIS)  
[www.seis.sc.edu](http://www.seis.sc.edu)

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