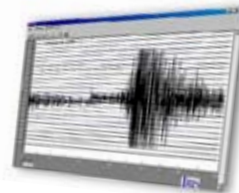


AmaSeis—Extraction & Save

How to Extract and Save an Earthquake signal

By [John Lahr](#) and Jenda Johnson (Watch video clips [Extract and Save 1](#) and [2](#) on the Internet)



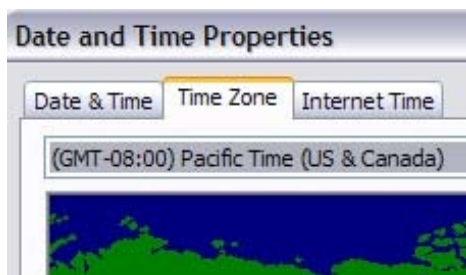
OK, you have a seismograph in your classroom and you paid attention in the workshop, but if you, like most teachers, weren't able to use it right away you may have forgotten some of the steps to find and save a seismogram.

No problem! All you need to do is type the numbers you see on these pages into your pull-down menus and you should have no trouble. If you do, contact the names you were given during your workshop. First, the set up 1, 2, 3:

1. SET TIME


Before you launch AmaSeis check the date and time on your computer. I have had the time wander which makes it difficult to find an earthquake. The software will record data based on these settings, and it is crucial that the time is as accurate as possible. Select: **Start Menu > Settings > Date/Time**

There are free programs that go out over the internet to a "time server" run by the National Institutes of Standards (NIST), [Time and Frequency Division](#), to periodically synchronize a computer's clock to accurate UTC time. A good, free program for this purpose is *AboutTime*: <http://www.arachnoid.com/abouttime/>. It is sufficient to have this, or a similar program offered free by NIST, reset the PC clock once every hour. Be certain to set the PC to your local time, and also set the time zone correctly. For example, for the west coast:



Then when you run AmaSeis, note that the time in the box at lower left corner will automatically be Universal Time (UT).

2. SET YOUR LATITUDE & LONGITUDE

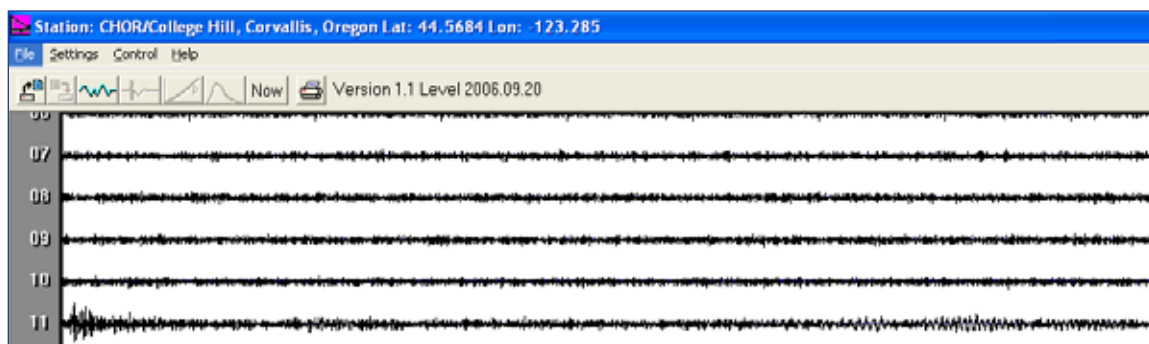
This information is needed to determine the angle between your station and the earthquake. An easy way to find your latitude and longitude is to use Google Earth (if you don't have it, you can [download here](#)). Zoom in until you find your school or house, click the tack tool, , on your location and a box will give you the information.

In AmaSeis, select **Settings > This Station**. I took an elevation from another map.

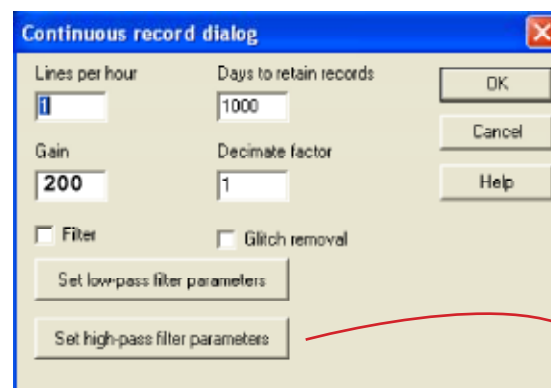
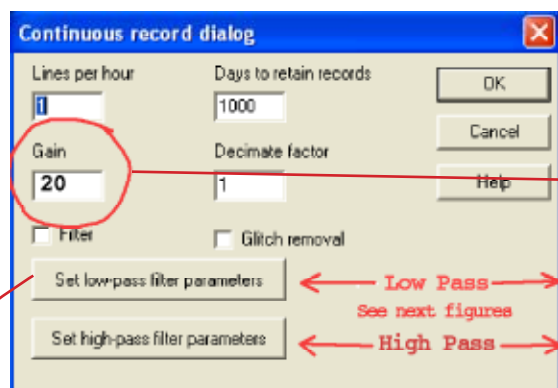
3. GET EARTHQUAKE INFO FROM WEB

You can either:

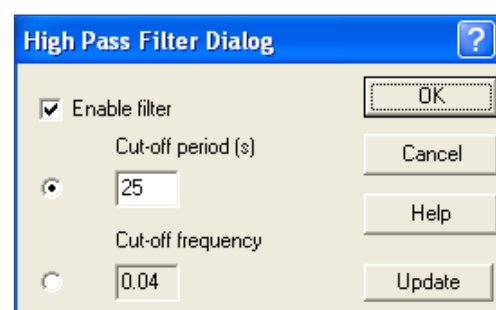
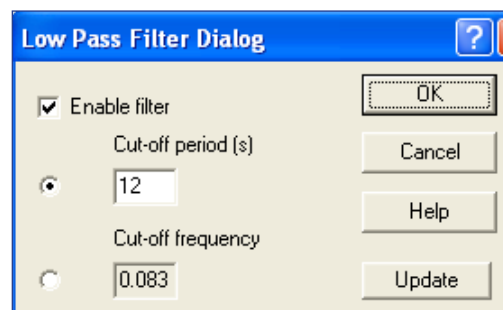
- 1) pick the start time of your seismogram and find an earthquake that matches the UTC time at <http://neic.usgs.gov/neis/qed/>, or
- 2) go to <http://earthquake.usgs.gov/> to select an earthquake of interest. Click on map until you get the information pop-up page for a particular small square. This will give you the date and time of the earthquake. You will need the UTC, Coordinated Universal Time to find the start of the seismogram on your computer because your computer is set to UTC.



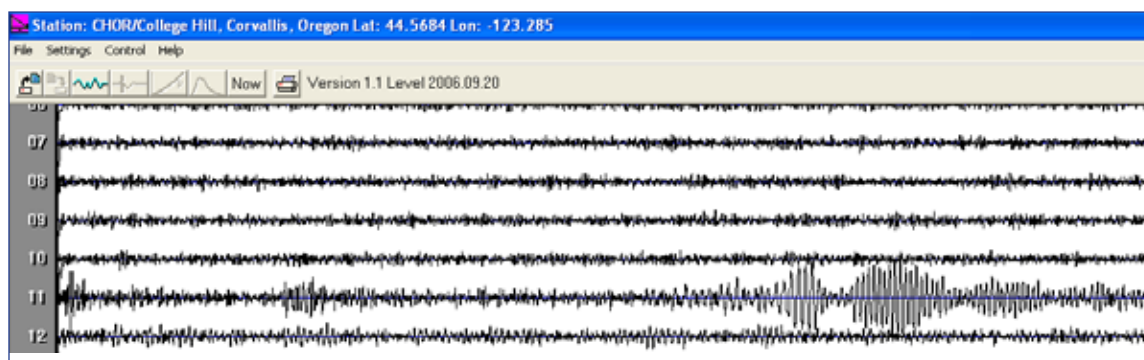
- 1) **Opening page of AmaSeis**—We know that there has been an earthquake at about 1100 hours (UTM). I recognize a typical surface wave signal here during the 11th hour. It is hard to see because it is without filtering, so I'll **enhance long period waves**. (See Low- and high-pass filter figures on next page)



To enhance signal, pull-down “Helicorder” and open the box above, I’ll increase the gain from 20 to 200 and set the low-pass filter to 12 seconds and the high-pass filter to 25 seconds.



With these settings periods shorter than 12 seconds and greater than 25 seconds will be attenuated. The event is much more obvious now, with these filter settings. Compare with image on previous page.



2) **WHERE WAS THE EVENT?** This event is more than 7 days old, so I looked up its location on this web site: <http://neic.usgs.gov/neis/qed/>. Had this been a more recent event, I would look it up at: http://earthquake.usgs.gov/eqcenter/recenteqsww/Quakes/quakes_all.php.

I’m sure this is a large earthquake, that the first arrival is early in the 11th hour, so the origin time must be later than 10:40 because the longest time possible between the origin time and the first arrival is 20 minutes. It must be the one from *Peru*:

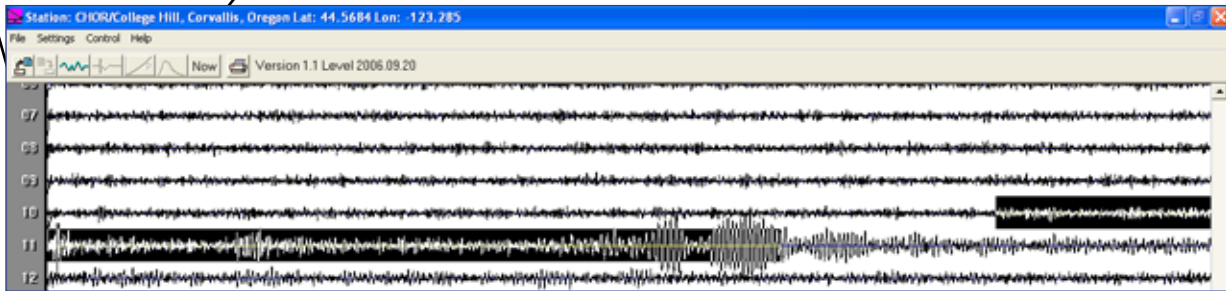
2006/10/20 11:14:33	60.66N	167.32E	18	4.9	NEAR THE EAST COAST OF KORYAKIA, RUSSIA
2006/10/20 10:52:59	17.99N	65.46W	18	2.7	PUERTO RICO REGION
2006/10/20 10:48:57	13.44S	76.57W	32	5.7	NEAR THE COAST OF CENTRAL PERU
2006/10/20 09:59:22	19.87N	121.34E	45	4.7	BABUYAN ISLANDS REGION, PHILIPPINES

This is a screen capture from <http://neic.usgs.gov/neis/qed/> which lists earthquakes more than a week old.

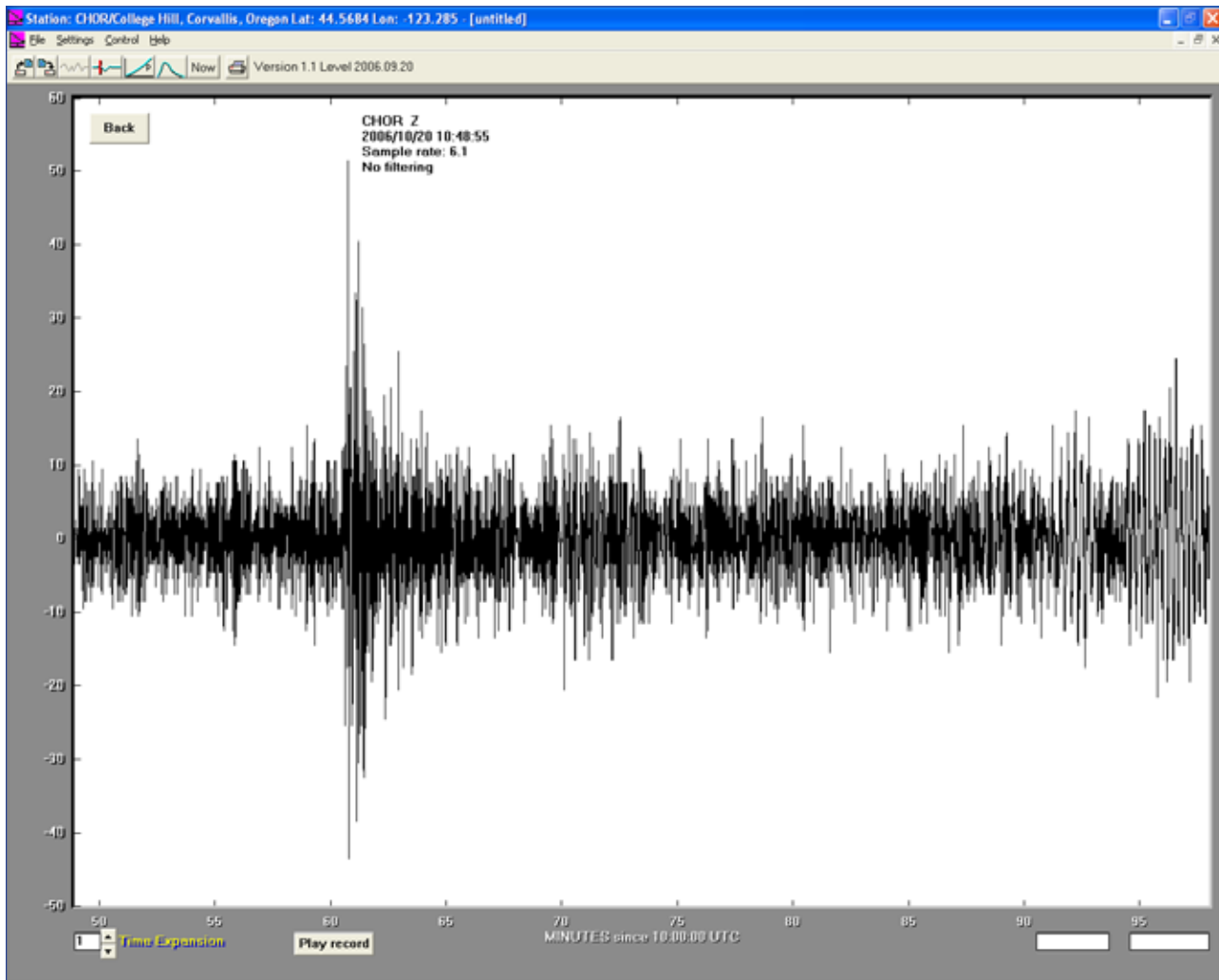
3) SELECT THE SIGNAL: Using the mouse and cursor, I'll highlight the trace below, starting at the origin time (10:48:57) and continuing through the largest amplitude surface waves. You can select the exact origin time the time box, second from left, in lower corner of screen. It reflects your exact location on the time line.



After highlighting the timeline, click on the blue squiggly seismogram icon....



...and the following window opens up:



Event Dialog

Event name: Peru

Seismogram start time (May be adjusted for errors in PC clock.)

Year: 2006 Month: 10 Day: 20

Hour: 10 Minute: 48 Second: 55.1

Magnitudes

MB: 0

MS: 0

ML: 0

MW: 6.7

Earthquake origin time

Year: 2006 Month: 10 Day: 20

Latitude (N positive): -13.44 Longitude (E positive): -76.57

Hour: 10 Minute: 48 Second: 57.0

Depth (km): 32

Time from event time to beginning of record (s): 1.9

Location of Seismic Waves program: c:\sw

OK Cancel Help Create files for Seismic Waves

4) RECORD THE EVENT ON THIS COMPUTER.

Since I know where this event is located, I'll enter the information from the USGS website under:

Settings > Event Dialog

This is what you will see on your extracted seismogram:

```

gon Lat: 44.5684 Lon: -123.285 [untitled]
ersion 1.1 Level 2006.09.20

CHIRP Z
2006/10/20 10:48:55
Sample rate: 6.1
No filtering
Lat: -13.44 Lon: -76.57 Depth: 32 km
Great-circle arc: 71.82 degrees
Mw: 6.7

```

At the top of the window, AmaSeis has now entered the earthquake's location, magnitude, and the distance to my station. (It knows the distance because you previously entered your own latitude, longitude, and elevation under **Settings > This Station**.)

Save As

Save in: AmaSeis

2006

gis

GSA_CAL_files

HelpManual

lahr as1

lahr disk

neic as1

nisqually

tonga 7.9

01.10.19Banda Sea.sac

3i2sq2i.sac

5w30_20w50.sac

5w30cal.sa

6hzcal.sac

20w50.sac

20w50cal.s

24microv.sa

120hz5w30

File name: 200610201048.sac

Save as type: SAC files (*.sac)

Save Cancel

5) SAVE THE EVENT.

Use the "File/Save As" dialog box to save this event in SAC format.

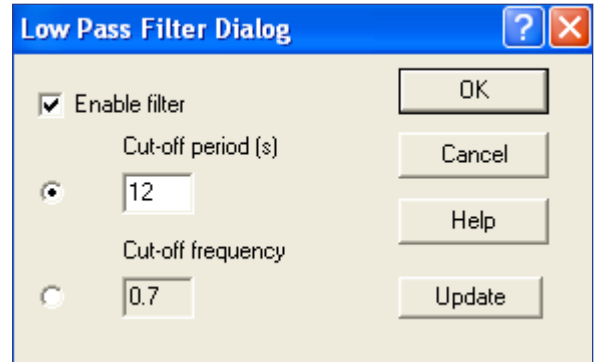
Select the folder AmaSeis:

Give the event a name. In this case, it is just called "Peru," but we often use the date, ex. "20061020-Peru".

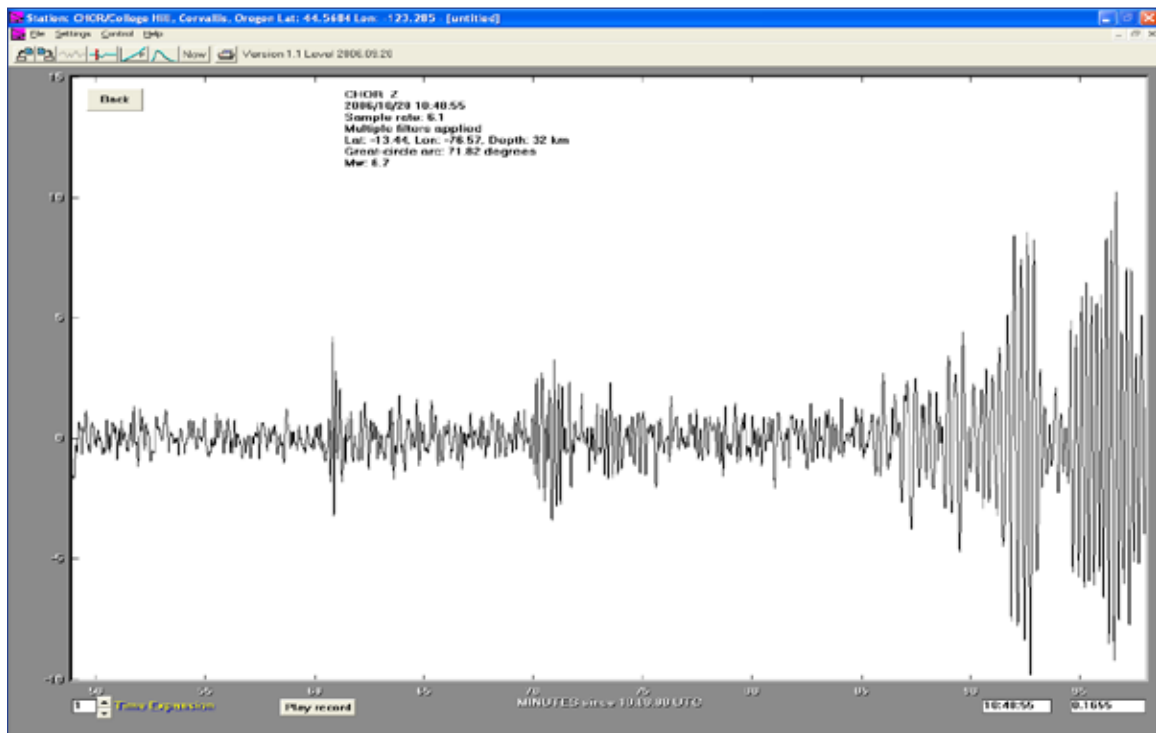
Type in the latitude and longitude from the USGS earthquake page page.

6) Want to make the image even better?

A filter may be applied to enhance this event.
Under Control/Filter set up a low-pass filter to
enhance periods longer than 12 seconds.



After **applying this filter twice**, the trace looks much “cleaner.” Even so, save the trace prior to filtering so that different filter choices can be made in the future. You will have at least two copies of the same even in your folder.

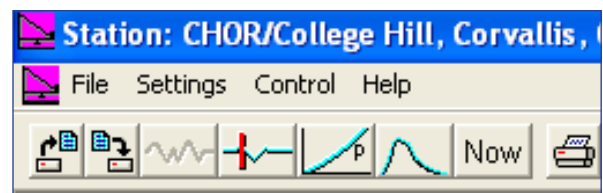


7) Want to have an instant printable image for your class?

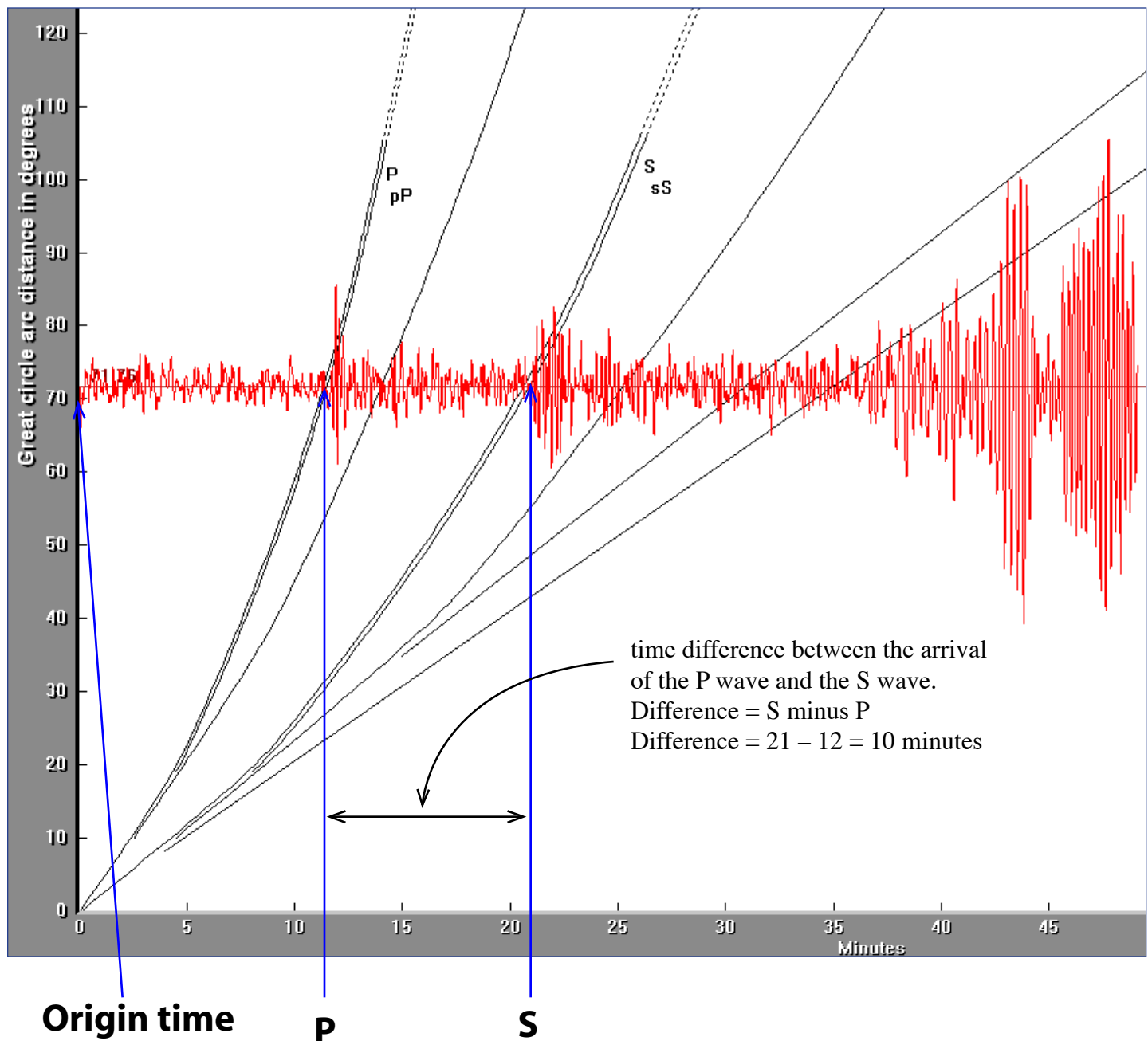
You can use the Alt/PrintScrn keys to capture this image in the paste buffer.
Paste it into an MSWord document, print it out and post it on a world map.

8) OK, let's look at P and S wave arrival times:

Next click on the travel-time curve icon, the
inclined blue line with the “P”:



With your mouse/cursor grab and slide the seismogram (red) up and down, keeping the start aligned with the Y-axis, as that represents the origin time (remember, you grabbed the seismogram beginning at the origin time of the earthquake). The P and S phases on the seismogram fit the travel time curve when the distance is about 72 degrees, as expected.



Resources for working with your AmaSeis

Video clips of John Lahr setting up the AS1 seismometer, calibrating Amaseis, Extracting seismograms:
<http://www.youtube.com/profile?user=IRISEnO&view=videos&query=lahr>

John Lahr's website, <http://jclahr.com/science/psn/as1/>, has many links to *Frequently Asked Questions*, video of the AS-1 set up, and more.

Interpreting Seismograms - A Tutorial for the AS-1 Seismograph can be downloaded at:

<http://web.ics.purdue.edu/~braile/edumod/as1lessons/InterpSeis/InterpSeis.htm>

AmaSeis upgrades: <http://www.geol.binghamton.edu/faculty/jones/AmaSeis.html>

IRIS' Seismographis in Schools program: <http://www.iris.edu/edu/AS1.htm>