Application of seismometer installed in your school

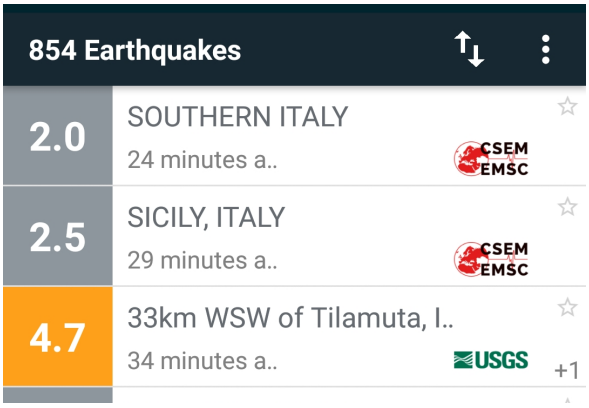
Special guide for teachers

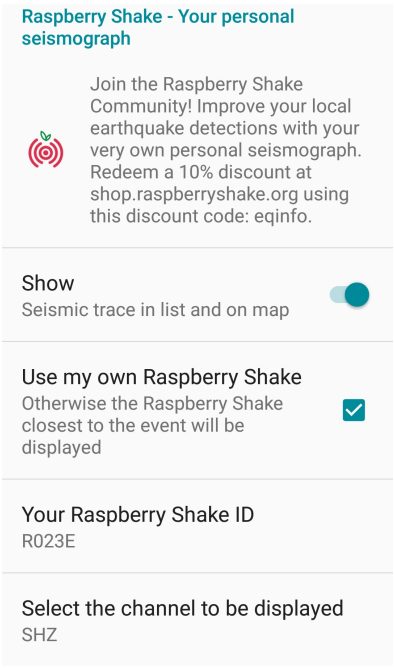
To see the waveforms recorded by the seismometer in your mobile:

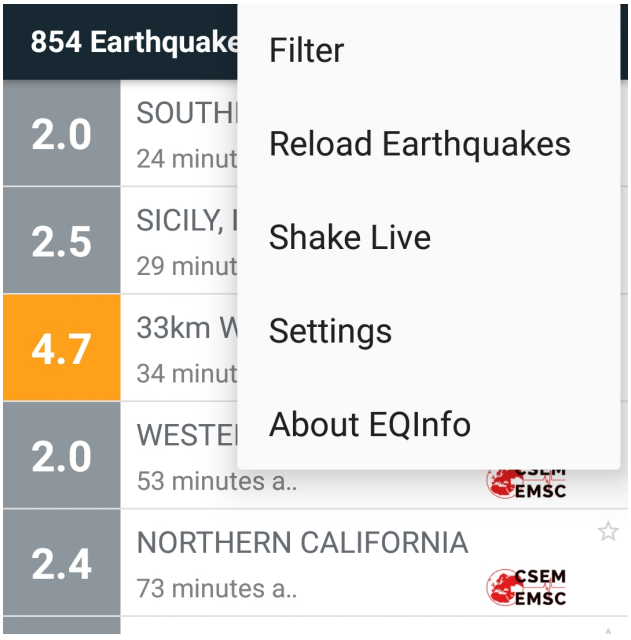
- Install EQInfo application in your smartphone (Android only)

- Go to the setting option at top right corner.
- Go to the Seismic data option and click to > show
- Use my own Raspberryshake √
- Your Raspberryshake ID: (5 letters starting with '**R**' or '**S**')
- Select the channel: (**EHZ** or **SHZ**)
- Go to **Shake Live** on the top right corner and see live recordings.
- For specific earthquakes, you can just click the earthquake from the list displayed.

Example:







To see the real-time waveforms in your computer:

Connect your Laptop (Wi-Fi) or computer (wired) with the internet that is already connected to the seismometer (same router).

You need to know IP address of your seismometer. For that,

- Install Fing application in your mobile (android or iphone)
- Establish Wi-Fi connection on your mobile from the same router that is connected to the seismometer.
- Scan for device
- Note the IP address of '**rs**' or '**raspberryshake**'. It should be 192.168……..

Software 1: jAmaSeis

- Go to the computer and see properties to know the operating bit of your computer e.g. 64-bit or 32-bit. Download correct version of the JAmaSeis following the link: https://www.iris.edu/hq/jamaseis/.

- Double click to the downloaded file.
- Installation of the jAmaSeis will be complete/finish when you choose 'Next' button.
- Open jAmaSeis
- Go to the file
- Add source
- Choose Raspberry Shake
- Edit the Seedlink IP address to: ***rs.local:18000***
- Get stations
- Add source
- OK

Then you can play with setting to change the display of real time waveforms. If there is earthquake then you can directly click and save waveform in. ***sac* format**, which is input for epicenter calculation and magnitude computation task later.

Software 2: SWARM

To install Swarm in your computer, please follow the following steps:

- All Raspberry Shakes come with Swarm which made available for download to your laptop of desktop computer from the Raspberry Shake web front end. You can download the pre-configured Swarm application from http://rs.local >> Actions >> DOWNLOAD SWARM (button).
- You will need a program to open the SWARM.zip file. You can easily find one in here: http://www.7-zip.org/. Download 7-Zip and install it.
- JAVA is required for running SWARM. To install java, please visit https://java.com/en/download/. Here you will find plenty of information and instructions for installing Java.
- Once you have successfully installed JAVA, navigate to the swarm folder and double click on the file named "swarm_console.bat". Swarm should open right away.
- Open Swarm
- Choose RaspberryShake (RS) Community
- Choose AM network
- Find out your Station ID and double click on that ID Name. Station names are arranged from 0 to 9, A to F.
- Note that there is a 30-minute time-lag for real-time data in SWARM.

SeisGram2K for Epicenter and Magnitude calculation:

Install SeisGram2k following the instruction on the link below

http://alomax.free.fr/seisgram/ver70/SeisGram2K_install.html

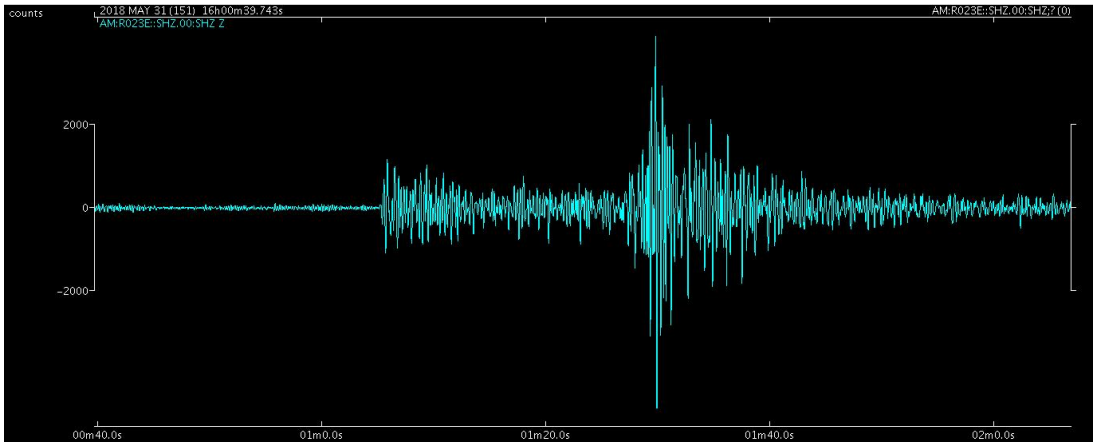
The SeisGram2K is a software for analysis of data recorded by seismometer. Note that you need to download data from webpage or save data from jAmaSeis software. Be careful while selecting the waveform from jAmaSeis as we need the portion of the waveform where P and S wave has been included. From the side of Seismology at school in Nepal, we plan to insert data directly to our webpage under the **Downloads** title.

To compute the epicenter of earthquake.

- Compute P and S-wave arrival time from at least 4 stations.
- Compute Ts-Tp for each station.
- Compute the distance using

$$\text{Distance} = (Ts-Tp)* 8.304 \text{ km}$$

Example:



In the figure, the P wave arrival time is at 1min 6 sec where amplitude of the waveform starts to increase. But, for S wave arrival time it is some kinds of tricky and needs more practice. Theoretically, where amplitude of the waveform starts to increase after P wave, that is the S-wave. In the figure above, S wave arrival time is at 1min 28 sec resulting the time difference of P and S wave arrival time 22 sec. For that value, the
Distance = 22 * 8.304 km = 183 km

This earthquake is recorded by the pilot station in Baglung, Galkot. So, from our calculation, we can say that the earthquake is 183 km far from Galkot. To find out the epicenter, we need four stations and four values of the distance. While plotting circle with the value of distance (radius of circle putting corresponding station at center), there will be single intersection point, which is epicenter of the earthquake. You can find out GPS co-ordinates of each station on the 1st page of this document and you should use the value of latitude and longitude in the Google earth before plotting the circles.

For Magnitude computation:

- Go SeisGram2k Application
- Remove mean
- Filter 1-10 Hz
- Integrate once
- Pick the highest value of S wave arrival
- Note the value
- Use the distance already computed
- Divide the value by 381407000 (for V6) and by 469087000 (for V4/V5) and multiply by 10^6.
- Use this value in the formula for Local magnitude (ML)
- ML = Log10(A)+2.56Log10(D) -1.67

  Note that A is in micrometer/second and D is in kilometer.