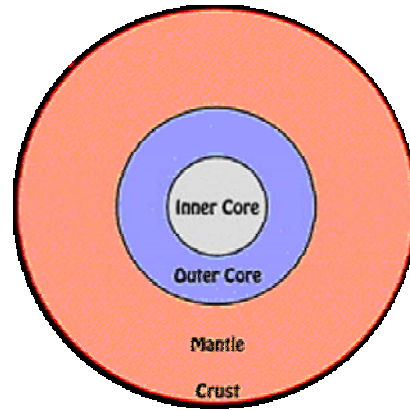


Earthquake waves

Introduction

There are four kinds of wave produced by an earthquake. Two move over the surface, causing damage, and two pass through the Earth itself: body waves.

By studying body waves, scientists have worked out what the Earth is like inside:

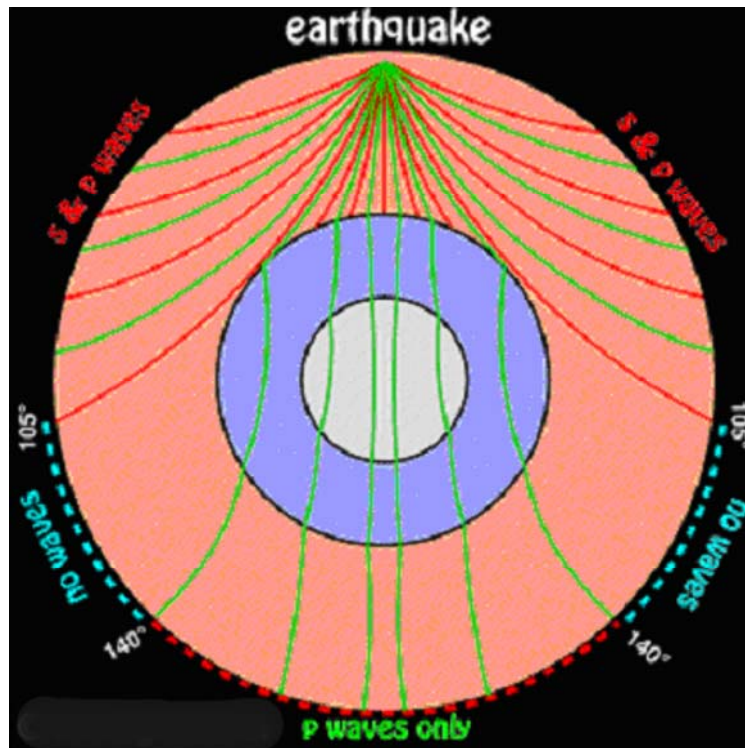


Body waves tell us a great deal about what we cannot see inside the planet.

- P-waves: Primary waves are longitudinal waves that push and pull the earth. They are the fastest body wave, averaging speeds of about 6 km/s and so arrive first.
- S-waves: Secondary waves are transverse waves, which make the earth shake from side to side. Slower than P waves, they average about 4 km/s and so arrive second.

Both S and P waves travel throughout the body of the earth, and can be picked up by seismometers - machines that record earthquakes - anywhere in the world.

However, it turns out that S waves cannot travel through the core, and only P waves are recorded in some places:



A seismometer records the vibrations from earthquakes. Mechanical versions work by way of a large mass, freely suspended.

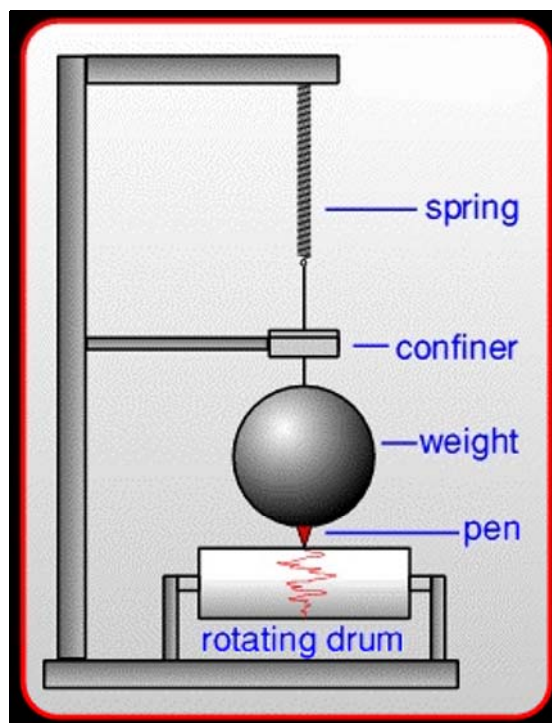
In the example on the right, a rotating drum records a red line on a sheet of paper. If the earth moves (in this case from left to right) the whole machine will vibrate too.

However, the large mass tends to stay still, so the drum shakes beneath the pen, recording a squiggle.

The confiner prevents the mass from bouncing around all over the place.

Incidentally, a seismograph is the graph that a seismometer draws.

You are going to simulate a seismometer.



Apparatus

Datadisc Au
Logbook XD
A serial lead or USB-serial lead





A Force sensor
Weights (400g)
Two bricks
A rubber band

Duration

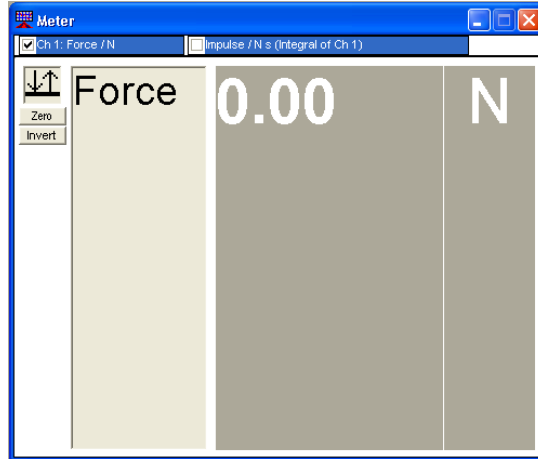
1 hour

Method

1. Plug the Logbook into the PC using a serial lead or USB-serial lead.
2. Plug the Force sensor into port 1. 
3. Place one brick on the table and the other on top.
4. Place the rubber band around it lengthways.
5. Place the Force sensor up.
6. Start Datadisc Au. 
7. To set up the Force sensor:

DatadiscAu.exe

- a. Click on “Measure” and then click on “Meter”. A menu will appear asking you to choose channels to meter.
- b. Click on “OK”. You will see the force reading.
- c. Place the weight on the top of the sensor.
- d. Unscrew the sensor as far as 0N; that is the middle of its range (or unscrew it as far as -4N before placing the weight on its top).



8. Close the Meter window.

9. Click on “Measure”.

10. Click on “Fast”. Then the Recording window will open.

11. Choose 200ms.

12. Choose Pre-trigger on Ch1: 10% approx.

13. To make the recording:



a. Click on the green recording icon on the toolbar: this starts the recording.

b. Hold the bottom brick and pull the rubber band gently, stretching and stretching it, until suddenly the top brick slides.

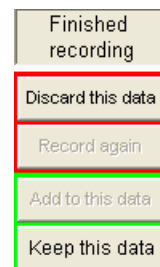
c. You should have recorded a first graph. You can try another one: change the place of the Force sensor and click on the green recording icon again. Repeat operation b. The further the sensor is from the brick, the lower the force is.



d. Stop recording by clicking on the red hand.

e. The graph(s) should show several peaks.

14. Click on “Keep this data”.

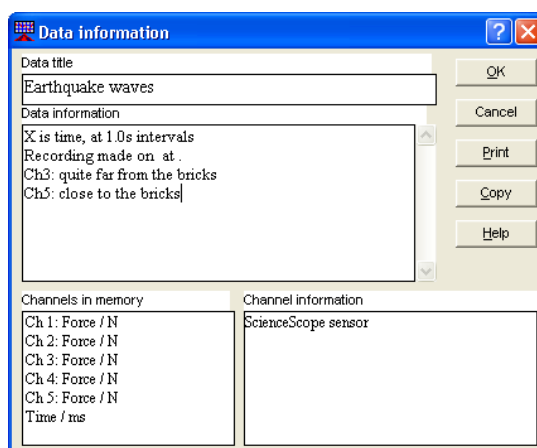


How to save your recording

1. Click on "File".
2. Click on "Save as...".
3. Choose the directory you want to save in and type the name of your file.
4. Click on "Save".

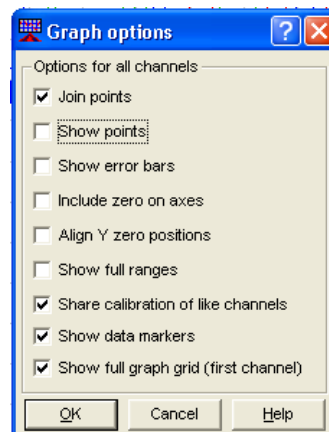
How to store information about your recording

1. Click on "Data".
2. Click on "Data information".
3. Type all the information you want in "Data title" and "Data information".



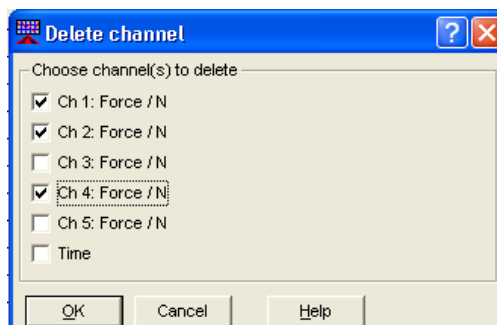
How not to show the points

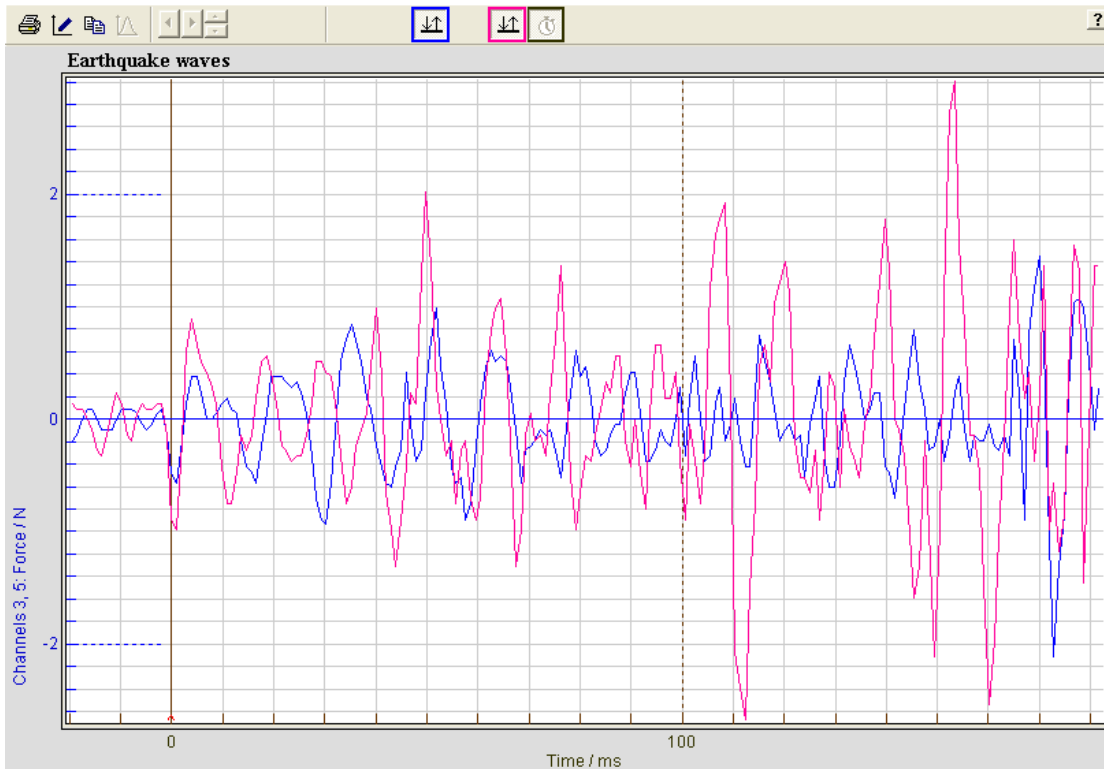
1. Click on "Graph".
2. Click on "Plot options...". The "Graph options" dialogue will open.
3. Remove the tick on "Show points".
4. Click on "OK".



How to delete the channel you are not interested in

1. Click on "Data".
2. Click on "Delete channel". The "Delete channel" dialogue will open.
3. Tick the channel(s) you want to delete.
4. Click on "OK".





How to save your file and exit

1. Click on "File".
2. Click on "Save".
3. Click on "File".
4. Click on "Exit".