

Introduction

Seisvole is a software modelling programme which maps the occurrence of earthquakes and volcanic eruptions since 1960. Its author (Alan Jones) has made it available as 'freeware' from <http://www.geol.binghamton.edu/faculty/jones>. The programme is entitled *seisvole.exe*. It gives the user the option of looking at the World and 8 regions.

Within the programme it is possible to set a number of parameters. In its original downloaded form, the model's graphics contain information in excess of what is required at GCSE although it may be considered to be appropriate as extension/ enrichment work for the most able or those taking Separate Sciences. The instructions given in the technician notes below allow for the setting up of a simplified version which is more appropriate within the general context of KS4. The activity outlined below is suggested for a whole class demonstration carried out as a teacher led activity using a LCD but it would be for students to use the programme in small groups.

Running the activity

It should be possible to run this activity as an introduction to plate tectonic processes. The pupils' prior knowledge should be ascertained especially as it is a revision of the Geography KS3 NC SoW Unit 21, Virtual volcanoes and internet earthquakes. The activity could be introduced as a demonstration, see 'A suggested teaching outline' below. This demonstration will provide pupils with evidence for the plate tectonic theory. It is worth asking the more able whether or not they think this is an accurate model.

Additional information

The programme is sophisticated and it is possible to view cross-sections across active plate margins. Pupils can use the programme, and they quickly learn how to control it.

More ideas

There is a vast amount of material available. A search using 'plate tectonics' on www.google.co.uk found 6440 pages in the UK alone.

- A UK school site:
www.moorlandschool.co.uk/earth/
- Up-to-date seismic monitoring for the last two weeks:
<http://www.iris.edu/seismon/>
- Continental drift and plate tectonics:
www.zephyrus.demon.co.uk/geography/resources/earth/tect.html

Learning outcomes

- Select relevant information from more than one source
- Develop ICT skills to communicate information
- The movement of the Earth's plates can give rise to earthquakes and volcanoes
- The earthquake and volcano patterns highlight plate boundaries
- The pattern of the depth of earthquakes indicates the type of plate of boundary
- Shallow focus earthquakes indicate divergent plate boundaries
- Shallow to deep focus earthquakes indicate convergent plate boundaries

Prior learning

- How igneous rocks are formed by the cooling of magma
- Geography KS3 NC SoW Unit 2, The restless earth – earthquakes and volcanoes
- Geography KS3 NC SoW Unit 21, Virtual volcanoes and internet earthquakes

Where the activity fits in

GCSE Syllabus (e.g. AQA Modular Double Award units, 15.4)

Skills

Communication, ICT.

Seismic Eruption is 'freeware', meaning that there is no charge for its use. It is available for download from:

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

Download [seisvole.exe](#). Once installed there are a number of changes that need to be made to the settings in order to make the programme more accessible for KS4 learners.

There are two elements to the programme, *Seismic Eruption Maintenance* and *Seismic Eruption* itself. Opening *Seismic Eruption Maintenance* allows the user access to the settings .

- Click [Seismic Eruption Maintenance](#)
- Click [Preferences](#)
- Click [Control](#)
- From the dropdown menu ensure that [Controls](#) are set as in Figure 1 below.

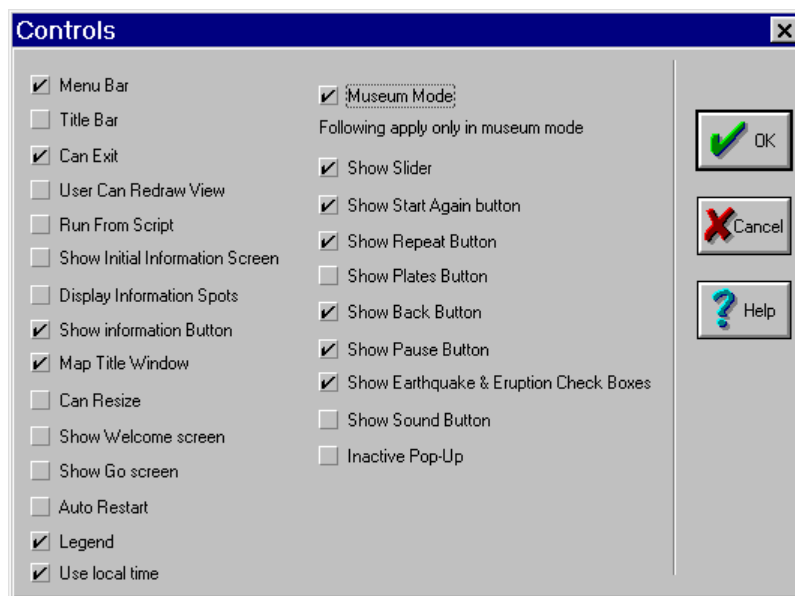


Figure 1.

These changes limit the pupils' access to certain elements of the programme and its appearance is less cluttered.

- Click [OK](#)
- Click [Exit](#)

These changes should now leave the programme ready for the users.

There is much useful information in the [Help](#) file for *Seismic Eruption Maintenance*.

Now load *Seismic Eruption*. You are presented with a view of the world, click [World](#). The programme will automatically start. You now need to decide how you will use the programme. The following settings are suggested:

- Click [Control](#)
- Uncheck all settings
- Click [Speed](#) and set to Stop
- Click [Earthquakes](#)
- Uncheck all settings
- Click [Volcanoes](#)
- Uncheck all settings
- Click [File](#)

- Click [Save View](#)
- Click [Exit](#)

When you load the programme again the second screen should look like Figure 2.

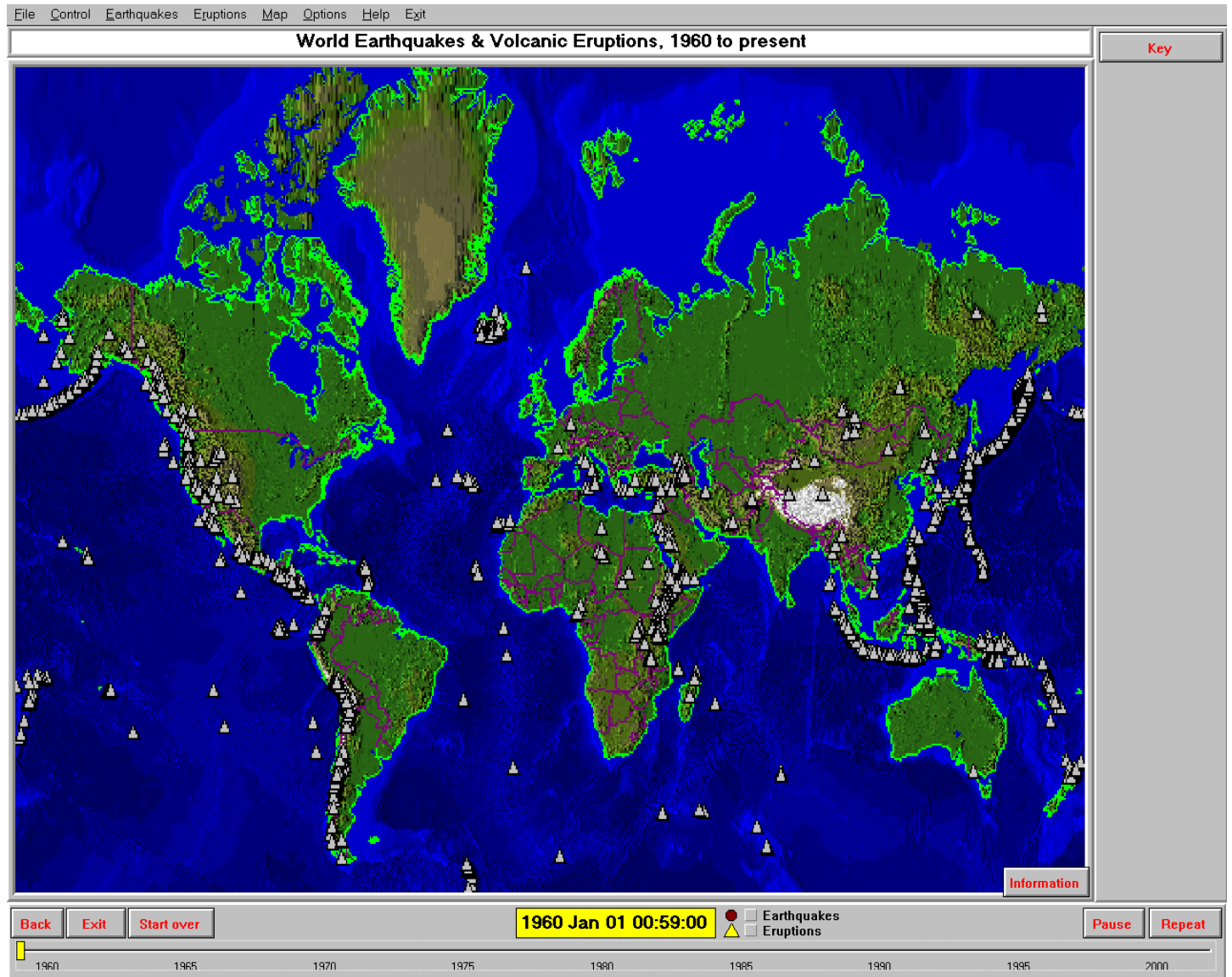


Figure 2

To run the programme you will need to first check the Earthquakes and Eruptions boxes next to the date. Then select 'Control' and the 'speed' you wish to run the simulation. A suggested speed is 4 years a second.

A suggested teaching outline

Set up the programme as in Figure 2 and select 'Eruptions' only. Run the programme by selecting >Control>Speed>4 years a second. You will finish with Figure 3 below.

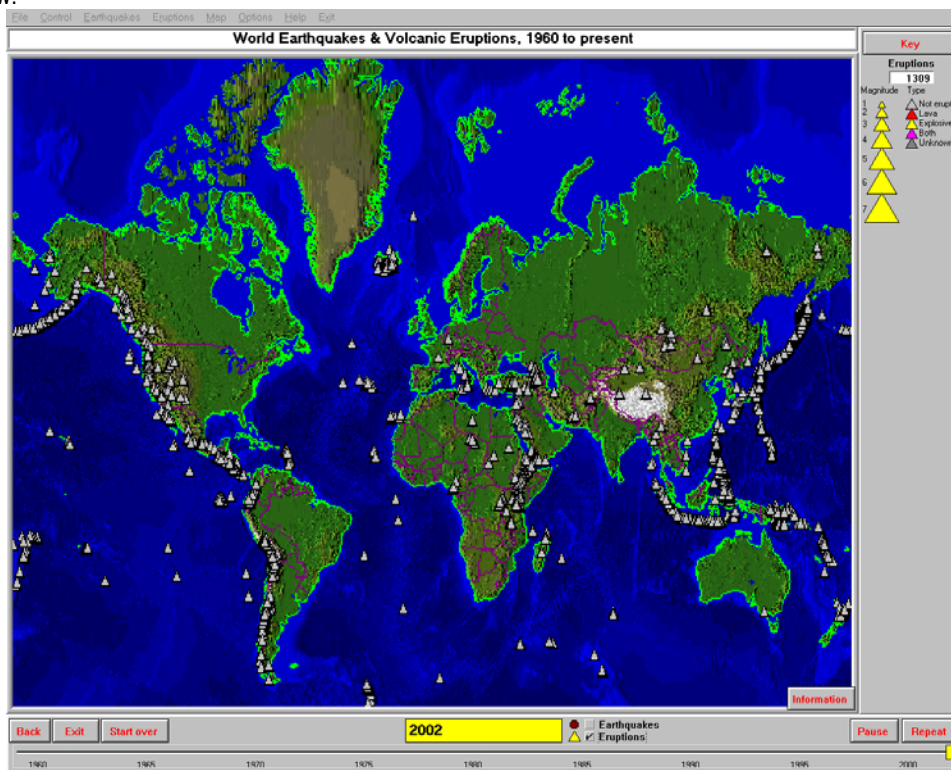


Figure 3

Ask the pupils if they can see any patterns. Where are the patterns prominent? *Where sea and land meet, e.g. South and North America and Pacific Ocean.* How many eruptions are given for this 43 year period? *1309 or approximately 30 eruptions a year.*

Run the programme again but this time select 'Earthquakes' only.

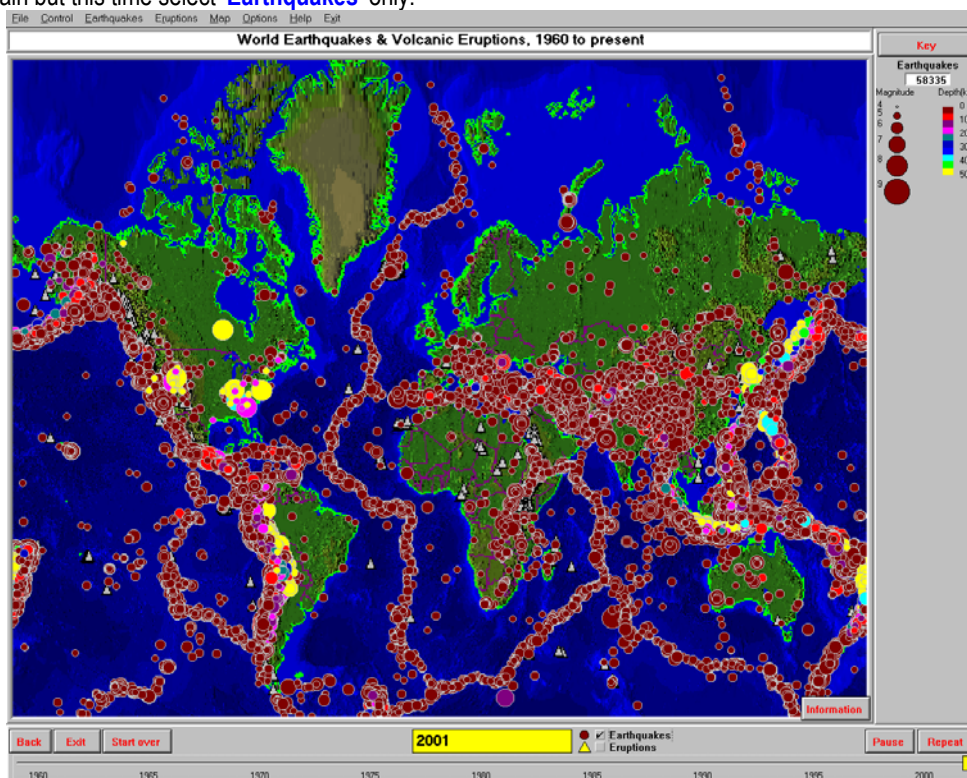


Figure 4

Ask the pupils if they can see any patterns. Where are the patterns prominent? How is the pattern different? *The earthquake pattern outlines the plate boundaries. The major difference is the ocean patterns which correspond to diverging plate margins.* The sheer number of earthquakes in this 43 year period is also impressive. How many earthquakes are given for this 43 year period? *58335 or approximately 1350 earthquakes a year.*

Do explain the keys on the screens. The depth of an earthquake is the most important one. Ask the pupils what they notice about the depth of earthquakes in general and in the mid-Atlantic Ocean in particular. *The majority of earthquakes occur between 0 and 100 km. In the mid-Atlantic they are all shallow focus where plates are diverging and new crust is being generated with lava being erupted over the sea floor. Shallow to deep earthquakes are seen in South America (where plates are converging).*

Return to the main screen by pressing 'Back' in the bottom left hand corner. Select **South America** and run the programme again. You will find that the sound has been turned on, this is an annoying feature of the programme. Press 'Pause' in the bottom right hand corner and go to **>Controls>Global Audio** and uncheck it, also go to **>Speed** and make it faster **>4 years a second** and press 'Pause' again.

Ask the pupils what they notice about the depth of the earthquakes. *They increase in depth landward.*

One way to illustrate this is to use the cross-section facility on the programme **>Control>Set up cross-section view ...>left click on map at Lascar>set azimuth 0, length 1000, width 100, click Re-draw>Map view/3-D/Cross-section>Cross-section view>Control>Speed>4 years a second**. This reads more complicated than it is to do! The programme's Help menu is useful. The result is shown in Figure 5.

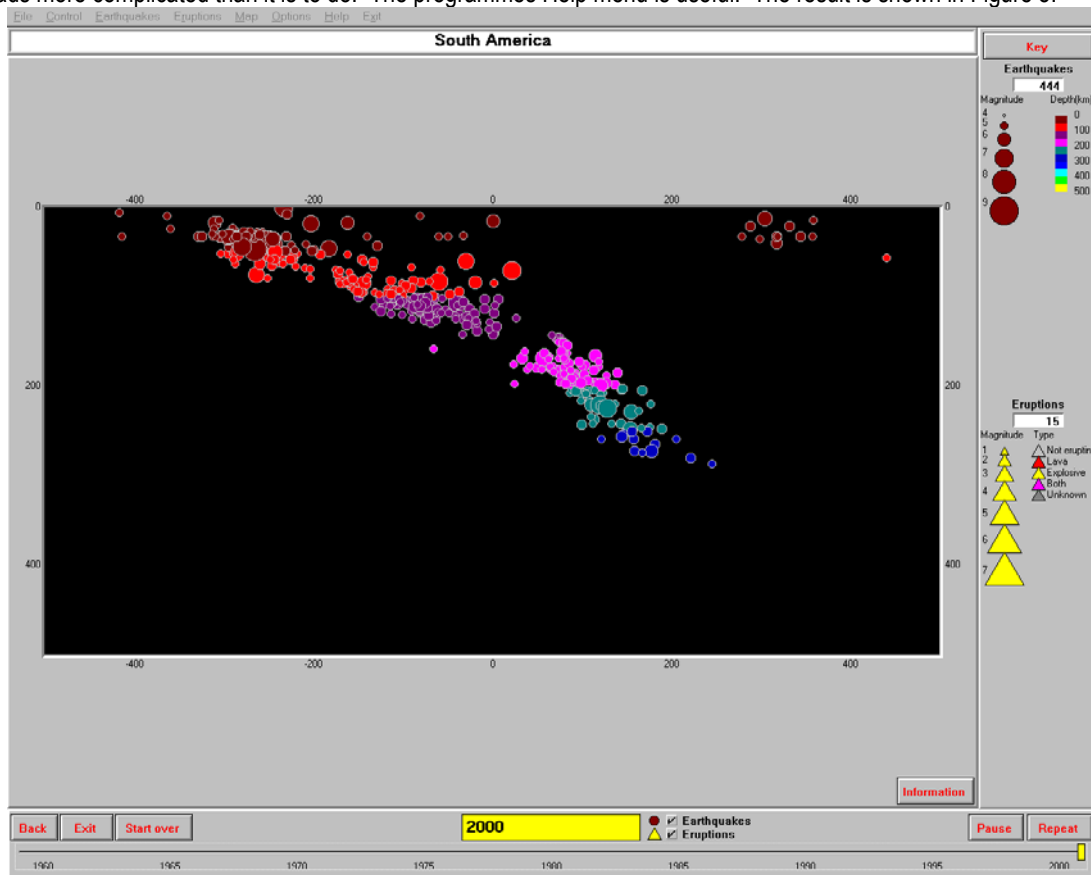


Figure 5

Why do they think this is happening? *One plate is going under another one. The plates converge. The Nazca Plate is descending under the South America Plate and this results in an inclined plane of earthquakes. The volcanoes are present due to the melting of the descending plate and surrounding lithosphere.*

If you wish you can choose a smaller time period by altering the dates; go to **>Control>Set dates**. Then press 'Repeat' in the bottom right hand corner to run the programme.