

STUDENT ACTIVITY: World of Quakes and Volcanoes

Activity idea

In this activity, students take on the roles of seismologists and vulcanologists, using maps to look for patterns in the worldwide distribution of earthquakes and volcanoes.

By the end of this activity, students should:

- see patterns in the worldwide distribution of earthquakes and volcanoes and develop an understanding of the idea of a dynamic Earth
- understand that New Zealand's location on a plate boundary explains why the country has so many earthquakes and volcanoes
- understand that specialists collaborate to provide evidence to support their ideas.

This activity was developed for the Earthquake Commission (EQC) and has been kindly provided for use on the Science Learning Hub.



[Introduction/background](#)

[What you need](#)

[What to do](#)

[Part 1 – seismologist instructions](#)

[Part 1 – vulcanologist instructions](#)

[Part 2 – specialists working together instructions](#)

[World map for vulcanologists](#)

[World map for seismologists](#)

[World map showing main tectonic plates](#)

Introduction/background

This activity is aimed at introducing students to the idea of a dynamic Earth; it is not an in-depth study of plate tectonics and Earth structure. They look for relationships between the plate boundaries and their data. They also relate the position of New Zealand to the occurrence of earthquakes and volcanoes.

They will see where New Zealand fits global patterns and help answer questions such as:

- Does everywhere in the world get earthquakes?
- Why do we get earthquakes in New Zealand?

Nature of science

The format of this activity reflects several aspects of the nature of science strand of the science curriculum:

- Understanding about science – students initially work in specialist groups, then collaborate to provide evidence to support their ideas.
- Investigating in science – students use data (presented as maps) to find evidence, construct simple models and develop simple explanations.
- Communicating in science – students will be introduced to some of the vocabulary of earth science, and will discuss and communicate their ideas.

What you need

For each group of 4 students, a copy of:

- Part 1 – seismologist instructions
- Part 1 – vulcanologist instructions
- Part 2 – specialists working together instructions
- World map for vulcanologists (works best in colour)
- World map for seismologists (works best in colour)
- World map showing main tectonic plates (works best as a clear overhead transparency)

What to do

1. Explain that the students are going to take on the roles of seismologists and vulcanologists. You could get your students to research and discuss what they think these different scientists do. (Seismologists study earthquakes, vulcanologists study volcanoes.) Each specialist will be relied on later to pass on information they have gathered, so this will only work if everyone plays their part.
2. Divide the class into groups of 4. In each group, designate 2 students as seismologists and 2 as vulcanologists. These pairs will work separately to start with, and reform as a group later.
 - Give the seismologists [Part 1 – seismologist instructions](#) and [World map for seismologists](#).
 - Give the vulcanologists [Part 1 – vulcanologist instructions](#) and [World map for vulcanologists](#).

The maps do not have country or region names on them, so you might like to have a general world map somewhere in the room for students to refer to.
3. In their specialist pairs, students look at their map and answer Part 1 questions.
4. Reassemble the groups of 2 seismologists and 2 vulcanologists. The specialists need to share what they have discovered:
 - Is there a relationship between the distribution of earthquakes and volcanoes?
 - What might cause the patterns they have observed?
5. Now give each group [Part 2 – Specialists working together instructions](#) and [World map showing main tectonic plates](#) (if the map is a transparency, they can lay it over and line it up with their data maps).
6. In their groups of 4, students look at their map and answer Part 2 questions.

Where on the plates do most earthquakes and volcanoes happen?

- *Most earthquakes and volcanoes are located along plate boundaries, where active movement of the Earth's crust is taking place.*

Name a plate boundary where there are more earthquakes than volcanoes.

- *Eurasian plate/African plate – Europe, especially Mediterranean.*
- *South American plate/African plate, and several others where the boundary is in mid-ocean.*
- *Eurasian plate/Indian plate – Himalayas.*

Name a plate boundary where there are more volcanoes than earthquakes.

- *North American plate/Eurasian plate – Iceland.*
- *There is a group of volcanoes in east Africa where there is not a plate boundary. This is the East African Rift Valley, where the African plate is being split into two separate plates.*

How does the position of New Zealand account for its earthquakes and volcanoes?

- *New Zealand is on the boundary between the Australian and Pacific plates, which explains why the country has so many earthquakes and volcanoes.*

Part 1 – seismologist instructions

You are seismologists – earthquake specialists.

Look carefully at the map you have been given.



What does this map show you?

Describe any patterns that you see in the data (such as groups or lines of dots, concentrations of different colours).

Which parts of the world get the most earthquakes?

Which parts of the world get the deepest earthquakes?

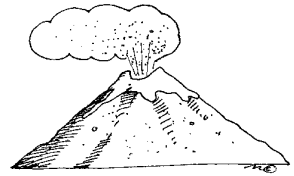
Which parts of the world don't get earthquakes?

What do you think might cause the patterns of earthquakes?

Part 1– vulcanologist instructions

You are vulcanologists – volcano specialists.

Look carefully at the map you have been given.



What does this map show you?

Describe any patterns that you see in the data (such as groups or lines of dots).

Which parts of the world have the most volcanoes?

Which parts of the world don't have volcanoes?

What do you think might cause the patterns of volcanoes?

Part 2 – specialists working together instructions

Your team should have seismologists and vulcanologists.

Look at the new map, showing the world divided up into what are called 'tectonic plates'.

Tectonic plates are sections of the outermost layer of the Earth (called the lithosphere) that 'float' on a hotter layer beneath (called the asthenosphere). Where plates meet is called the plate boundary. Tectonic plates are moving very, very slowly; some move towards each other, some move away from each other, some slide past each other.

Look at how the plates relate to where earthquakes and volcanoes happen.

- Are earthquakes and volcanoes found in the same parts of the plates?

Where on the plates do most earthquakes and volcanoes happen?

- Discuss whether volcanoes or earthquakes *only* happen on boundaries.
- Discuss whether all boundaries have the same number of earthquakes and volcanoes.

Name a plate boundary where there are more earthquakes than volcanoes.

Name a plate boundary where there are more volcanoes than earthquakes.

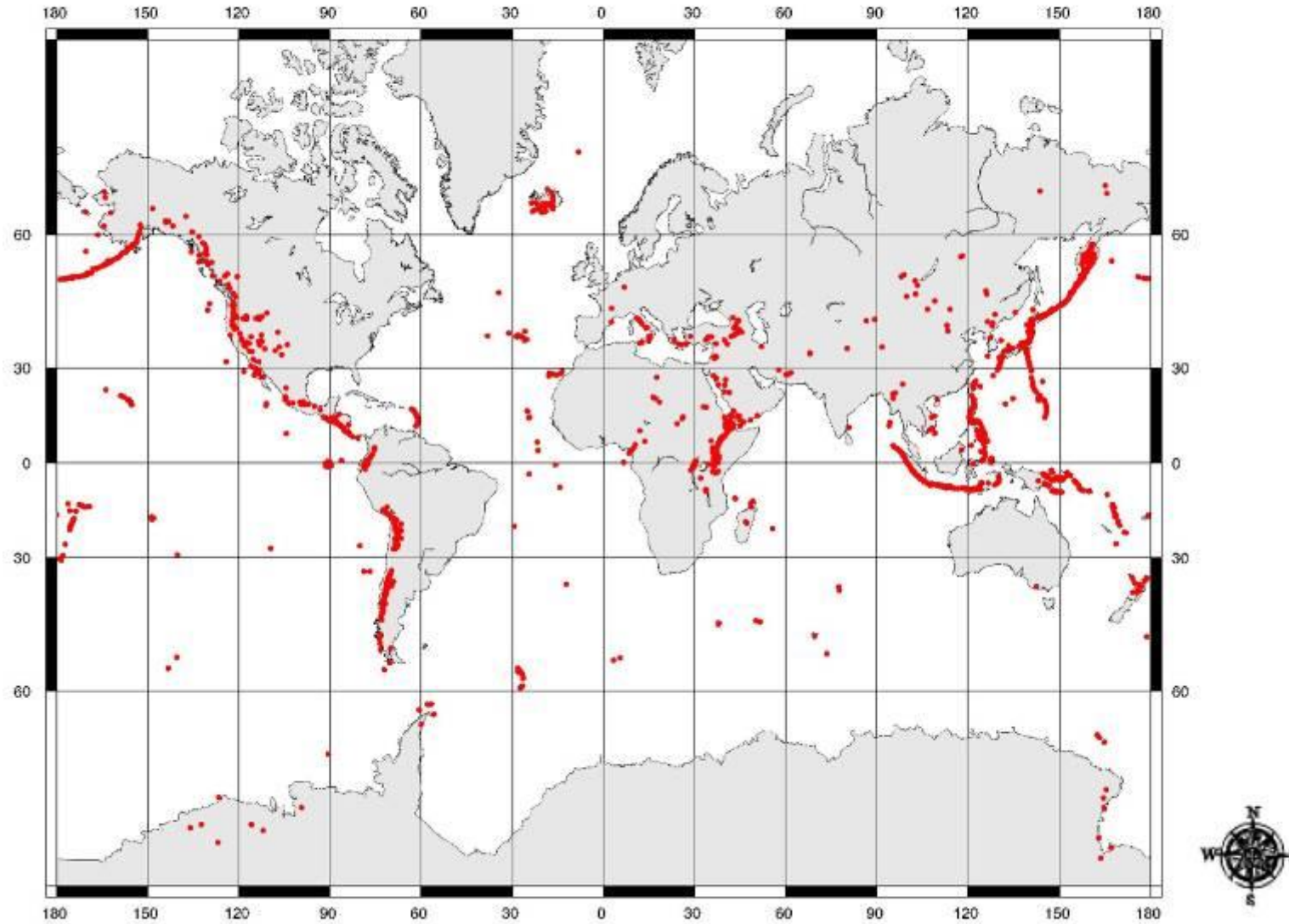
Find New Zealand on the data maps.

How does the position of New Zealand account for its earthquakes and volcanoes?

World of quakes - Part 1

World map for volcanologists

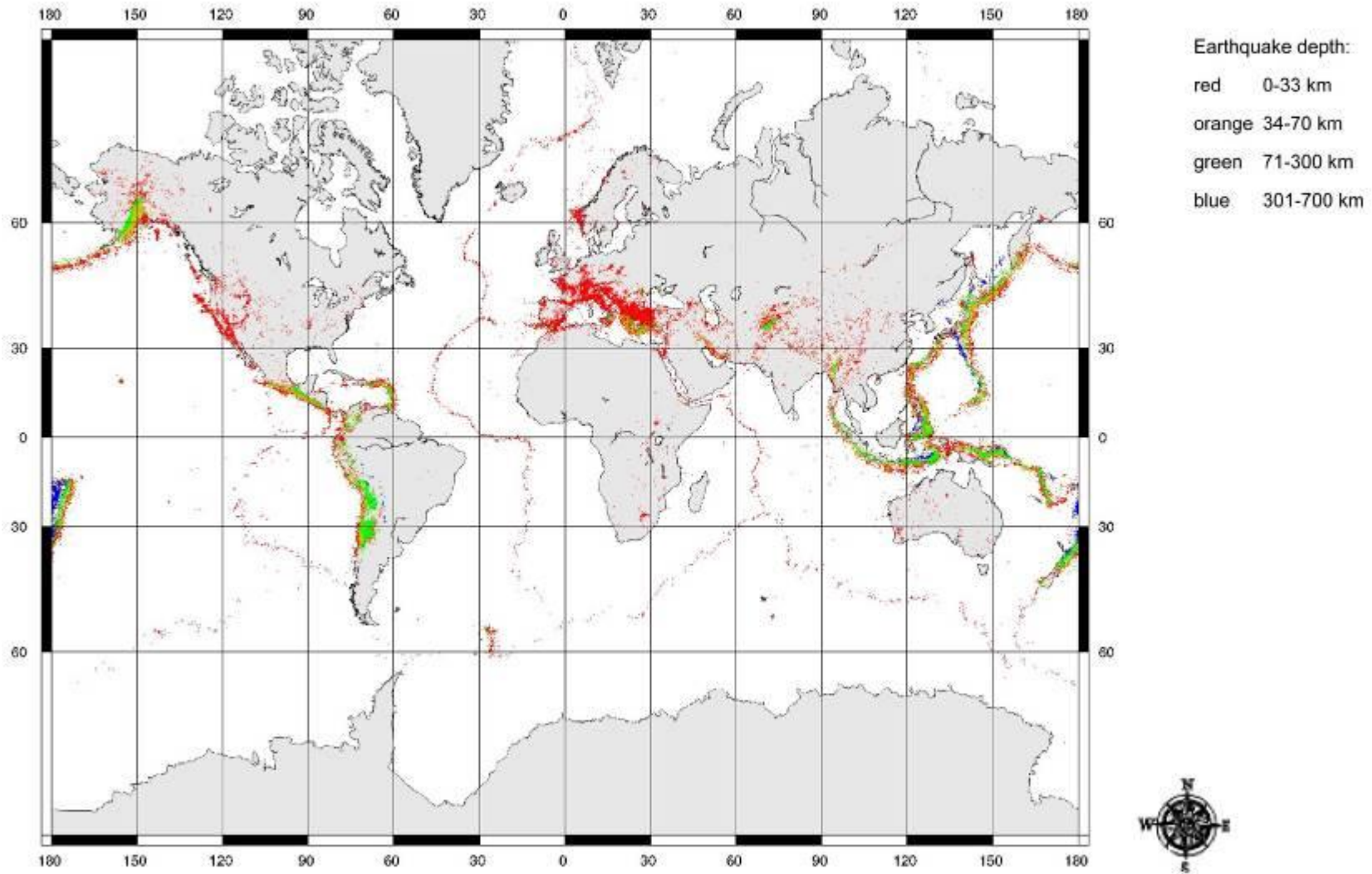
Each red dot indicates a volcano that is active now, or has been in the past



World of quakes - Part 1

World map for seismologists

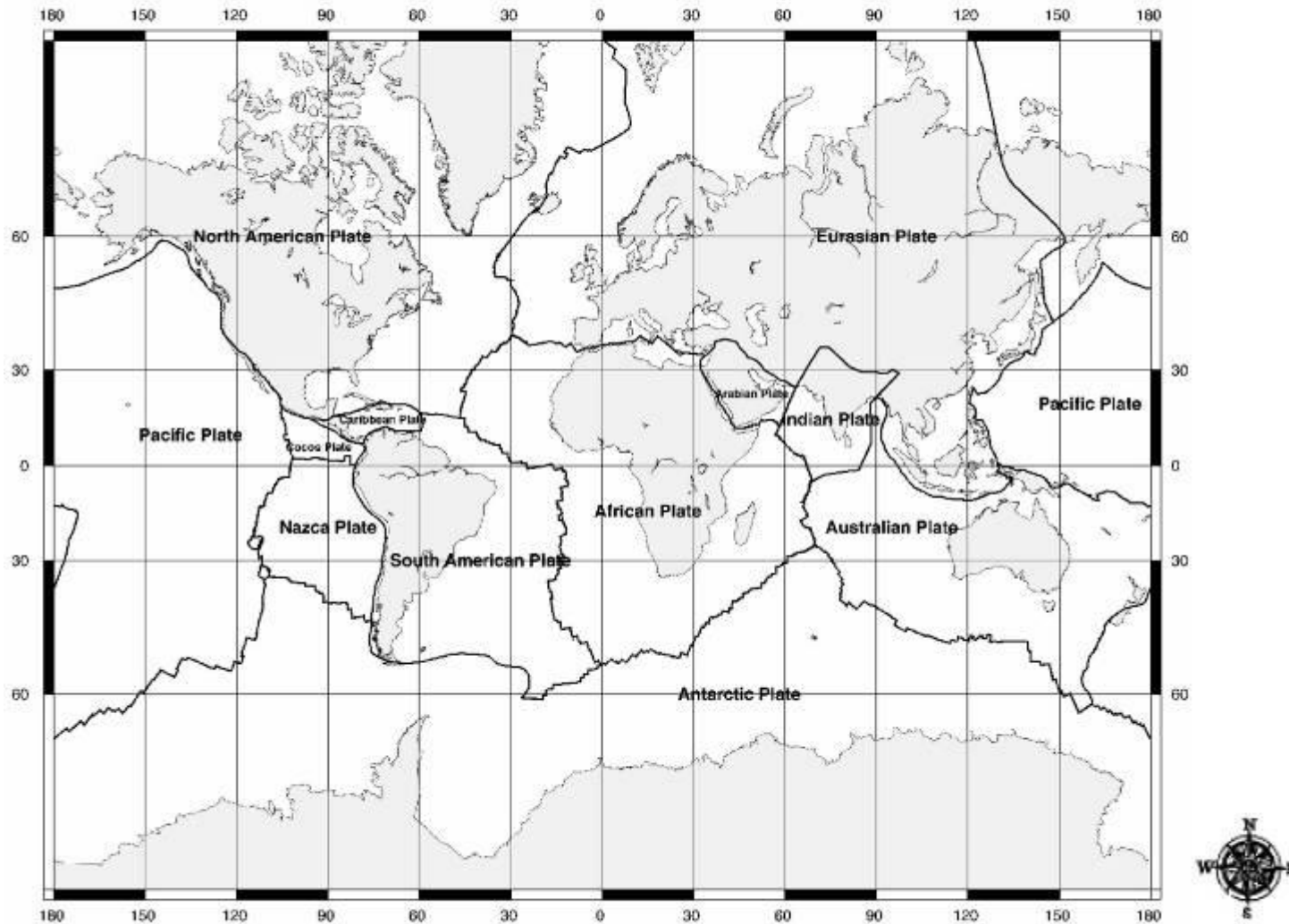
Each dot indicates an earthquake of magnitude 4 or higher, in the period 1990-1996



This map was created for a classroom exercise by Dale Sawyer at Rice University, USA

World of quakes - Part 2

World map showing main tectonic plates



This map was created for a classroom exercise by Dale Sawyer at Rice University, USA