

Plate tectonics and earthquakes

Lesson Map: <http://esriaustralia.com.au/education/SpatialActivity3>

Engage

Where do earthquakes occur?

- ➔ Click on the lesson map link above to commence the lesson.
- ➔ Within the 'details' pane, click to open the map 'contents.'
- ➔ Tick the checkbox to turn on the layer 'Global quakes of magnitude 5.8 or greater'
- ? What pattern is visible? *[Distinct areas with higher rates of earthquakes. Advanced students may identify relationship to plate boundaries]*
- ➔ Zoom in to view Australasia.
- ? Where do earthquakes most commonly occur in Australasia? *[New Zealand, PNG, Indonesia, The Philippines, and Japan]*
- ? Optional question for students familiar with plate tectonic theory: Why are there no large earthquakes within Australia? *[Australia sits in the middle of a plate, and earthquakes are most common at plate boundaries]*
- ? Option question for students unfamiliar with plate tectonic theory: Are there any larger earthquakes within Australia? Why might this be the case? *[No large earthquakes within Australia. Reasoning will vary.]*

Explore

How do plates interact at boundaries?

- ➔ In the 'details' pane, under the heading 'content,' tick the checkbox to turn on the layer 'relative motion at plate boundaries.' Zoom in to view this layer.
- ➔ Press the 'bookmarks' button above the map. Click on the first 3 bookmarks (South America, California, and Mid-Atlantic Ridge).
- ? How are the plates interacting at these 3 points? *[South America is two plates*

Download student worksheet [here](#).

Time
30 minutes

Activity

Visualise plate tectonic theory, to understand the role of plate movement in causing earthquakes.

Learning Outcome

Students will be able to:

- Differentiate between the 3 types of interactions that occur at plate boundaries
- Explain the global pattern of earthquakes
- Understand the relationship between plate boundaries and earthquakes

ACARA Curriculum Link

[Year 8 Geography – Unit 1: Landforms and landscapes](#)

[ACHGK053](#) | [ACHGS058](#) | [ACHGS060](#) | [ACHGS059](#)

[Year 9 Science – Earth and space sciences](#)

[ACSSU180](#) | [ACSIS169](#) | [ACSIS170](#)

[Senior secondary Curriculum – Geography – Unit 1: Natural and ecological hazards](#)

[ACHGE012](#) | [ACHGE013](#) | [ACHGE014](#) | [ACHGE015](#) | [ACHGE017](#) | [ACHGE019](#) | [ACHGE007](#)

[Senior secondary Curriculum – Earth and environmental science – Unit 4: The changing Earth](#)

[ACSES098](#) | [ACSES099](#) | [ACSES100](#) |

moving towards each other; California is two plates moving past each other in opposite directions; Mid-Atlantic Ridge is two plates moving away from each other]

- ➔ Click the checkbox to turn on the 'plate boundaries' layer. Then, open the legend to interpret this layer.
- ? What are the 3 main types of plate boundaries, and what happens at each?
[Convergent boundaries are two plates moving together; divergent boundaries are two plates moving apart; transform boundaries are two plates sliding past each other in opposite directions]

Explain

How are the plates around Australia moving?

- ➔ Press the 'bookmarks' button. Click through bookmarks 4-10 on the list.
- ? What plate boundaries exist around Australasia? *[New Zealand - convergent and transform; Solomon Sea - convergent; Indonesia - convergent; Philippines – convergent; Pacific Ocean – divergent with some transforming sections]*

Extend

How does earthquake depth change at different boundaries?

- ➔ Tick the checkbox to turn on the layers 'South American quakes' and 'plate boundaries.' Turn off all other layers.
- ? What kind of boundary is occurring along the South American coast?
[Convergent]
- ➔ Click on the layer name 'South American quakes' to reveal additional icons. Click on the icon that says 'change style.'
- ➔ Under the heading '1- choose an attribute to show' select 'Depth_km' from the dropdown list. You must select 'done' to action these changes'
- This symbology varies in size per the depth of earthquake epicenters.
- ? What do you notice about the distribution and depth of earthquakes along this boundary? *[Earthquakes only occur on the continent, and not in the ocean. The further inland the earthquake occurs, the deeper the epicenter]*
- ? How do earthquakes occur differently at different plate boundaries? *[To answer*

ACSES091 | ACSES089

Acknowledgements:

This lesson map uses data sourced from an Esri GeoInquiry.

Accompanying lesson material has been amended to align with the Australian National Curriculum.

Teacher Feedback:

To share your feedback on this, or any Spatial Activity, please contact education@esriaustralia.com.au

this, ask students to fill out the table below. Students will need to repeat the steps above to change the symbology for the layers 'California quakes' and 'Mid-Atlantic quakes']

Boundary Type	Earthquake location on boundary	Pattern of Earthquake depth
Convergent - South America	<i>[Only on the land side]</i>	<i>[Gets deeper further inland]</i>
Divergent - Mid-Atlantic	<i>[Close boundary]</i>	<i>[Random, more shallow]</i>
Transform - California	<i>[Both sides of the boundary]</i>	<i>[Random, mixed depths]</i>

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