## **Mountain Building**

Audience: Years 6-11 Earth Science, Geography

Time Required: 15 minutes

Activity:	This activity illustrates how global mountain ranges are formed related to plate motions
Standards:	<ul> <li>Some possible links to NZ Curriculum in this inquiry</li> <li>Science Level 5 <ul> <li>Investigate the composition, structure, and features of the geosphere, hydrosphere, and atmosphere.</li> </ul> </li> </ul>
	Geography
	AS91013 Describe aspects of a geographic topic at a global scale
Learning Outcomes:	Students will:
	<ul> <li>describe forces at work in mountain building.</li> </ul>

## Map URL: <u>http:/arcg.is/DfKWT</u>

### Engage

#### Does the North or South Island have the highest mountain range?

- Click the map URL link above to start the map.
- With the Details pane visible, click the button, show Contents of Map.
- Click the button, Bookmarks.
- Select the South Island bookmark, and then click the North Island bookmark for closer examination. You may need to zoom in further.
- ? Compare and contrast the mountains of the North and South Island. [Similar tend NE-SW
- Contrast: A volcano Mt Ruapehu (2753m) is highest point in North Island, North island ranges are generally lower ( around 1300-1500m) than South Island Mountains . Highest point in South Island is Mt Aoraki (Cook) 3676m. Several other peaks are over 2000m]

## Explore

#### Where do mountains form?

- With the Details pane visible, click the button, Show Contents of Map.
- Turn on the layer, Tectonic Boundaries. Click the title and click on the legend symbol
- Convergent boundaries are where two plates are colliding, Divergence boundaries are where plates are moving apart. Transform boundaries are where plates are sliding passed each other
- ? What type of boundaries do we have in New Zealand [convergent in the North Island and Southern South Island, transform in central South Island]
- Click the button, Bookmarks. Select the bookmark, All Mountains.
- Turn on the layer, World Mountain Ranges,
- Mountains are "built up" through pressures on the earth's crust when plates collide.
- ? Where do mountain ranges occur in relationship to tectonic plates? [Most form at the plate boundary edges because of collisions.]





## Explain

#### Do some plate boundaries produce mountains better?

- ? Count the number of mountains that occur near each boundary type. Based on this information, from which type of boundary are mountains more likely to occur? [Convergent produces about 25, divergent produces about 6, and transform produces about 8.]
- ? Why would this plate boundary type be better at creating mountains? [The greater relative velocity of converging plate crashes provides more energy for piling up mountains.]

#### Elaborate

#### Are there exceptions to this rule?

- Turn off the layer, World Mountain Ranges.
- Turn on the layer, Ranges Away From Boundaries.
- Search for mountain chains that do not appear to be located near plate boundaries.
- Look at the Great Dividing Range in Australia.
- **?** From what you are learning about how mountains form, which plate would Australia have had to collide with to form these mountains? [*Pacific.*]
- ? Is there evidence in New Zealand of this collision? Which range is it? [The Southern Alps were formed at the same time as the Great Dividing Range Australia.]
- ? Why do some mountain ranges appear not to be located near plate boundaries? [Many of these ranges formed from old plate boundaries that are no longer active.]

#### **Evaluate**

#### What influences the height of the mountains?

- Turn on the layer, Plate Motions (mm/year).
- Consider how mountain heights might compare to the speeds of the colliding plates.
- ? With this in mind, rank which mountains you think are higher: Himalayas, Ural Mountains, and Rocky Mountains. [Himalayas = 8839m, Rocky Mountains = 4389m, Ural Mountains = 1890m.]
- ? What is the relationship between the speed of plates and height of mountain ranges? [The faster the plates are moving, the higher the mountain ranges.]

## **Key Skills**

#### Measure

- Click the button, Measure.
- Click the Distance button. Select units of measurement.
- Click once on the map to start the measurement; click again to change direction and double click to stop measuring.

#### Bookmark

- Click the button, Bookmarks.
- Choose the desired bookmark.
- The map will change location and scale.





# **Next Steps**

**DID YOU KNOW?**: ArcGIS Online is a mapping platform freely available to New Zealand public and private schools. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at <u>http://www.eagle.co.nz/gis-schools</u>.

### THEN TRY THIS...

- Log in to your ArcGIS organization account and perform analysis on World Mountain Ranges.
- Use the Find Location tool to manually find mountain ranges located within 100kms of any plate boundary.
- Create an expression to find World Mountain Ranges Within a Distance of 150 Kms From Tectonic Boundaries.

## **Text References**

- Motion of tectonic plates <u>http://arcg.is/2n7rMO8</u>
- Anderson, Lois. Nature's Fury Pearson NZ (2012)
- Peat, Justin, Lockyear. Geography on the Edge Level 1 Year 11 Geography (second edition) Cenage (2012)
- Science NCEA Level One (NZ Pathfinder Series), George Hook, New House Publishers Ltd, 2004
- Science Book B, George Hook, Nelson Cengage Learning, 2008
- Science Year 10 (NZ Pathfinder Series)George Hook, New Houses Publishers Ltd, 2005
- New Directions in Science NCEA Level 1, Anne Wignall and Terry Wales, Pearson Education NZ, 2006

# **NEW ZEALAND GEOINQUIRIES**

http://arcg.is/1GPDXe

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