
Tropical Storms

Audience: Year 11 Geography, Earth Science

Time Required: 15 minutes

Activity: Use hurricane track information to understand factors that encourage the formation of hurricanes.

Standards: Some possible links to NZ Curriculum in this inquiry
Science Level 7

- Develop an understanding of the causes of natural hazards and their interactions with human activity on Earth.

Geography

- Global Issue; process that produces a global pattern

Learning Outcomes: Students will...

- Students will use the tracks of hurricanes in 2005 to compare wind speed to the air pressure within the hurricane and sea surface temperature.
- Students will determine the impact of air pressure and sea surface temperature on hurricane strength.

Map URL: <http://arcg.is/0ejzDO>

Engage

Where do tropical storms form?

- Note that Tropical Cyclones have different names in different regions of the world-South West Pacific: Tropical Cyclones, Atlantic: Hurricanes
- Check the box next to Wind Speed -Tropical Storms South West Pacific 2015-16 to turn the layer on.
- ? What information is stored for each point along the way? [*Information about air pressure, and wind speed is stored.*]
- All Tropical Cyclones start as tropical depressions (TD).It could be helpful to check out the Saffir Simpson Classification of Tropical Cyclones <http://bit.ly/2mmywZr>
- Use the Filter Tooltip instructions to filter Tropical Storm Wind Speed – Category - Is less than 33 (knots).
- Click to latitude and longitude grids. Zoom in so that the 5 degree grid is visible
- ? Where do most SW Pacific Tropical cyclones form? [*between 5-15S in the west Pacific*]
- Click on the Hurricane 2005 and select the Atlantic bookmark
- ? Do Atlantic hurricanes form between similar latitudes in the northern hemisphere? [*Yes between 10-15 degrees north in east Caribbean*]

Explore

How does air pressure relate to wind speed in hurricanes?

- Hover on the Wind Speed -Tropical Cyclones SW 2015-16 Pacific layer names, click the right drop-down arrow, and then click Show Table.
- In the Wind Speed -Tropical Cyclones SW 2015-16 Pacific table, click the WIND SPEED (wind speed in knots) column header.
- Click Sort Ascending to arrange the wind speed values in increasing order.
- ? As you scroll down the table, how does the pressure column change relative to wind speed? *[They are inversely proportional to each other.]*

Explain

Where do tropical storms get such strength?

- Zoom out to see the whole world
- Turn on the Sea Temperature 05 layer.
- Click the Sea Temperature 05 title, and then click the AvSeaTemp05 subtitle to expand this layer's legend.
- ? At what temperature do storms consistently pick up energy? (You can also click the dots of the filtered Tropical storms to verify temperatures.) *[sea surface temperature is above 26.5°C, although once formed, they can persist over lower sea-surface temperatures.]*

Exlaborate

How strong was Cyclone Katrina?

The 2005 Atlantic storms which included Hurricane Katrina caused \$160 billion in damage and 3,913 deaths. Winds cause property damage by blowing off roofs or collapsing buildings, but they also push the surface of the water into a storm swell. Homes and small buildings do not stand a chance against storm-driven ocean swells. Winds are generated by greater differences in air pressure and the geographic size of the low pressure.

- Explore Cyclone Katrina further. Use the Filter Tool key skills instructions to filter Hurricane Wind Strength – Category - Is – Katrina
- Click on each point to see a pop up with details of category wind speed sea temperature
- ? What was the wind speed of Katrina when it reached New Orleans? *[an H4 storm at 125 knots OR an H3 storm at 110 knots]*
- Click each dot, and on a whiteboard, create a table of wind speeds and pressure.
- Create a graph of wind speed vs. pressure. *[Wind speed should be on the x axis. The pressure should be on the y axis—the resulting graph will go down to the right.]*
- ? What type of relationship do these two variables have? *[This is an inverse relationship]*

Evaluate

What other areas of the world have good conditions for tropical storms?

- Click the Home button to zoom out to the entire world.
- ? List two other areas in the world that would be possible targets for tropical storms. *[China, Philippines, Indonesia, and Indian Ocean are all possible targets.]*

Key Skills

Filter data

- Hover on the layer name, click the drop-down arrow, and choose Filter.
- Build the expression Name - Is - Unique.
- Scroll down to choose a unique hurricane name.
- Click Apply Filter, and then click Zoom To

Bookmarks

- At the top of the map, click the Bookmarks button.
- Choose your bookmark; the map will take you there.

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 <http://www.eagle.co.nz/gis-schools>.

THEN TRY THIS...

- 2015-2016 was a severe season for Tropical Cyclones in the SW Pacific. Apply a filter and explore TC PAM further
- How close did TC Pam come to New Zealand? What impact did it have?

Text References

- Peat, Justin, Lockyear. Geography on the Edge Level 1 Year 11 Geography (second edition) Cenage (2012)

NEW ZEALAND GEOINQUIRIES

<http://arcg.is/1GPDXe>