Unit 1 overview

In this unit, students explore where, when, and why tropical cyclones occur. The following overview explains how the unit follows the 5-E learning cycle and gives tips for teaching specific activities.

Unit objectives

In this unit, students will

- explore where tropical cyclones do and do not form;
- explain when tropical cyclones form, and relate their seasonal nature to the hemisphere in which they form; and
- relate seasonal sea surface temperature conditions to tropical cyclone formation.

1.1 – The Great Hurricane of 1900 (Engage)

Eyewitness accounts of natural disasters are excellent motivators and discussion starters. Introduce this activity by inviting your students to share their personal experiences with hurricanes. While not all students will have direct experience, most should be able to contribute something relevant. Current events also make excellent discussion starters, and show that tropical cyclones are global phenomena. Two good sources of recent global environmental events are **Earthweek: A Diary of the Planet**, (http://www.earthweek.com) and the **Earth Watch Disaster Relief** website (http://www.disasterrelief.org/EarthWatch/).

Following this introduction, have students read the introduction to the activity, followed by the **Special Report on the Galveston Hurricane** by Isaac M. Cline. Tell students to watch for and list specific hurricane hazards, mentioned both directly and indirectly, as they read. After reading Cline's report, have students work in small groups to complete Activity 1.1.

Use these experiences and events to consider tropical cyclones from many different angles. What are they? Were and when do they form? What causes them? During your discussion, record all ideas on an overhead transparency or a large sheet of paper. Save the list of questions and ideas and return to them for exploration or discussion later in the unit.

1.2 – Discovering cyclone patterns (Explore)

In this activity, students investigate *where* and *when* tropical cyclones form (and the corollary, where and when they *don't* form). This plants the idea that heat, in the form of warm ocean water, is a driving force in tropical cyclone formation, while leaving openings suggesting that heat is not the only factor.

1.3 – Understanding tropical cyclone physics (Explain)

The text and illustrations in this activity explain solar insolation, seasons, the rotation and steering of the Coriolis effect, and the significance of the tropics to tropical cyclone formation. They describe the process by which water vapor and latent heat liberated through condensation provide the energy that drives tropical cyclones.

Use the questions with this section as an assignment or as the basis for a discussion to check students' understanding of the concepts.

1.4 – Powering tropical cyclones (Elaborate)

In this section, students explore seasonal variations of sea surface temperature by measuring the distribution of warm surface water in each hemisphere and viewing an animation of sea surface temperature maps. Then, students classify and graph the sea surface temperatures over which tropical cyclones formed, and discover the minimum temperature needed to form and maintain tropical cyclones.

1.5 – Solving the cyclone puzzle (Evaluate)

In this activity, students summarize what they have learned about the conditions necessary to form tropical cyclones. They discuss the presence or absence of each of these factors in the cyclone-free regions of the South Atlantic and Southeast Pacific Oceans. Although there is no single obvious cause, you may need to encourage them use the process of elimination to find the likely cause or causes. Since warm water and rotation are present in those areas, the remaining factors—high vertical wind shear and, to a lesser extent, a scarcity of low-pressure storm systems—are the probable culprits. A quiz is also provided in the Instructor Guide to assess students' understanding of basic concepts.