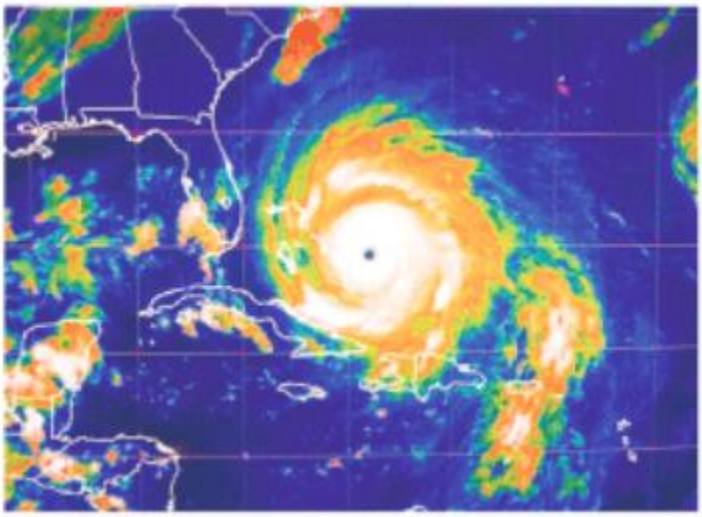
Hurricanes

If you've ever been to the tropics or seen photographs of these regions, you know that warm breezes, steady temperatures, and heavy but brief tropical showers are the norm. It is ironic that these tranquil regions sometimes produce the most violent storms on Earth. **Whirling tropical cyclones that produce winds of at least 119 kilometers per hour are known in the United States as hurricanes.** In other parts of the world, these severe tropical storms are called typhoons, cyclones, and tropical cyclones.

Regardless of the name used to describe them, hurricanes are the most powerful storms on Earth. At sea, they can generate 15-meter waves capable of destruction hundreds of kilometers away. Should a hurricane hit land, strong winds and extensive flooding can cause billions of dollars in damage and great loss of life. Hurricane Floyd, which is shown in a satellite image in Figure 20, was one such storm. In September 1999, Floyd brought flooding rains, high winds, and rough seas to a large portion of the Atlantic coast. More than 2.5 million people evacuated their homes. Torrential rains caused devastating inland flooding. Floyd was the deadliest hurricane to strike the U.S. mainland since Hurricane Agnes in 1972. Most of the deaths caused by Hurricane Floyd were the result of drowning from floods.



AP/Wide World Photos

Figure 20 This satellite image of Hurricane Floyd shows its position off the coast of Florida a few days before the hurricane moved onto land. Floyd eventually made landfall near Cape Fear, North Carolina.

Hurricanes are becoming a growing threat because more and more people are living and working near coasts. At the close of the twentieth century, more than 50 percent of the U.S. population lived within 75 kilometers of a coast. This number is expected to increase even more in the early decades of this century. High population density near shorelines means that hurricanes and other large storms place millions of people at risk.

Names of Hurricanes: Actually, the names are given once the storms reach tropical-storm status (winds between 61–119 kilometers per hour). Tropical storms are named to provide ease of communication between forecasters and the general public regarding forecasts, watches, and warnings. Tropical storms and hurricanes can last a week or longer, and two or more storms can be occurring in the same region at the same time. Thus, names can reduce the confusion about what storm is being described.

The World Meteorological Organization creates the lists of names. The names for Atlantic storms are used again at the end of a six-year cycle unless a hurricane was particularly destructive or otherwise noteworthy. Such names are retired to prevent confusion when the storms are discussed in future years.

Occurrence of Hurricanes

Most hurricanes form between about 5 and 20 degrees north and south latitude. The North Pacific has the greatest number of storms, averaging 20 per year. The coastal regions of the southern and eastern United States experience fewer than five hurricanes, on average, per year. Although many tropical disturbances develop each year, only a few reach hurricane status. A storm is a hurricane if the spiraling air has winds blowing at speeds of at least 119 kilometers per hour.

Development of Hurricanes

A hurricane is a heat engine that is fueled by the energy given off when huge quantities of water vapor condense. **Hurricanes develop most often in the late summer when water temperatures are warm enough to provide the necessary heat and moisture to the air.** A hurricane begins as a tropical disturbance that consists of disorganized clouds and thunderstorms. Low pressures and little or no rotation are characteristic of these storms.

Occasionally, tropical disturbances become hurricanes. Figure 21 shows a cross section of a well-developed hurricane. An inward rush of warm, moist surface air moves toward the core of the storm. The air then turns upward and rises in a ring of cumulonimbus clouds. This doughnut-shaped wall that surrounds the center of the storm is the **eye wall**. Here the greatest wind speeds and heaviest rainfall occur. Surrounding the eye wall are curved bands of clouds that trail away from the center of the storm. Notice that near the top of the hurricane, the rising air is carried away from the storm center. This outflow provides room for more inward flow at the surface.

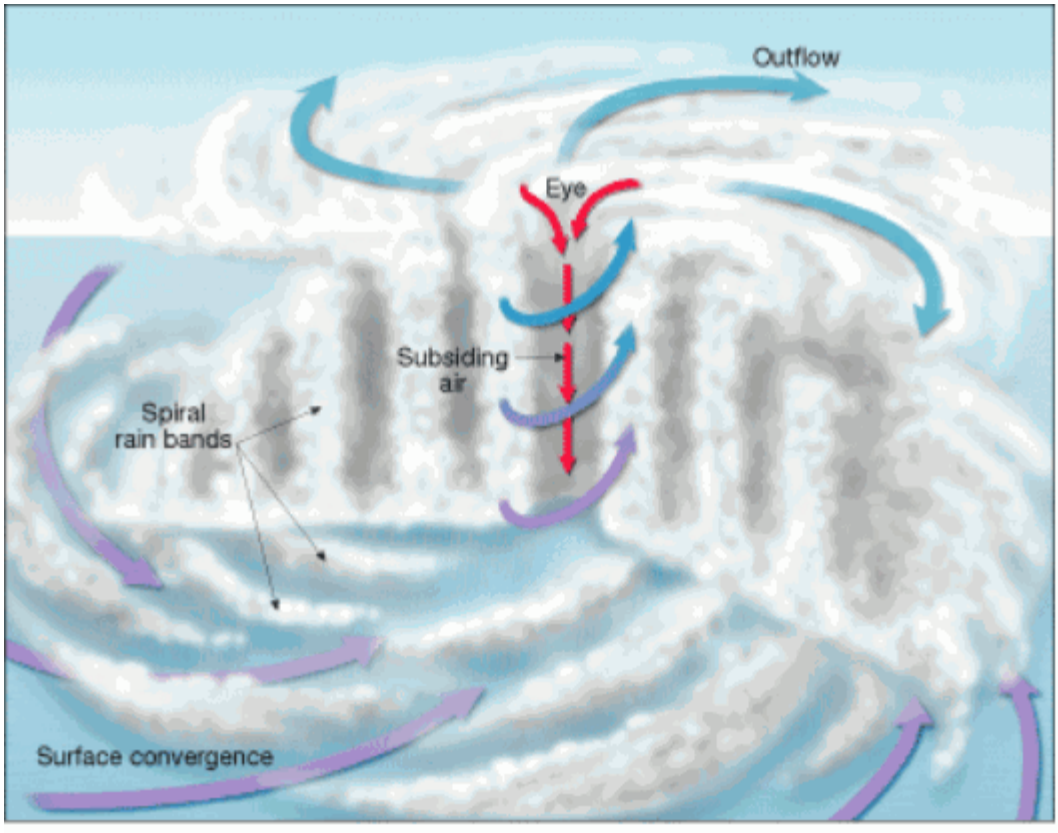


Figure 21 Cross Section of a Hurricane The eye of the hurricane is a zone of relative calm, unlike the eye wall region where winds and rain are most intense. **Describing** Describe the airflow in different parts of a hurricane.

At the very center of the storm is the **eye** of the hurricane. This well-known feature is a zone where precipitation ceases and winds subside. The air within the eye gradually descends and heats by compression, making it the warmest part of the storm.

Hurricane Intensity

The intensity of a hurricane is described using the Saffir-Simpson scale shown in Table 2. The most devastating damage from a hurricane is caused by storm surges. A **storm surge** is a dome of water about 65 to 80 kilometers wide that sweeps across the coast where a hurricane's eye moves onto land.

Table 2 Saffir-Simpson Hurricane Scale

Category	Sustained Wind Speeds (kph)	Typical Damage
1	119–153	Storm surge 1.2–1.5 meters; some damage to unanchored mobile homes, shrubbery, and trees; some coastal flooding; minor pier damage.
2	154–177	Storm surge 1.6–2.4 meters; some damage to buildings' roofs, doors, and windows; considerable damage to mobile homes and piers; moderate coastal flooding.
3	178–209	Storm surge 2.5–3.6 meters; some structural damage to small buildings; some large trees blown over; mobile homes destroyed; some coastal and inland flooding.
4	210–249	Storm surge 3.7–5.4 meters; severe damage to trees and signs; complete destruction of mobile homes; extensive damage to doors and windows; severe flooding inland.
5	> 249	Storm surge >5.4 meters; complete roof failure on many buildings; some complete building failure; all treees and signs blown away; major inland flooding.

A hurricane weakens when it moves over cool ocean waters that cannot supply adequate heat and moisture. Intensity also drops when storms move over land because there is not sufficient moisture. In addition, friction with the rough land surface causes winds to subside. Finally, if a hurricane reaches a location where the airflow aloft is unfavorable, it will die out.