Tropical Cyclones

▲ Hurricane Allen attacks the coast of Texas with 100 mph winds.

We call them by sweet-sounding names like Firinga or Katrina, but they are huge rotating storms 200 to 2,000 kilometers wide with winds that blow at speeds of more than 100 kilometers per hour. Weather professionals, or **meterologists**, know them as tropical cyclones, but they are called hurricanes in the Caribbean Sea, typhoons in the Pacific Ocean, and cyclones in the Indian Ocean. They occur in both the northern and southern hemispheres. Large ones have destroyed cities and killed hundreds of thousands of people.

▲ Satellite images of the 2004 hurricane season. Satellite data can help meteorologists predict where hurricanes are heading, but accurate long-term predictions are difficult to make.

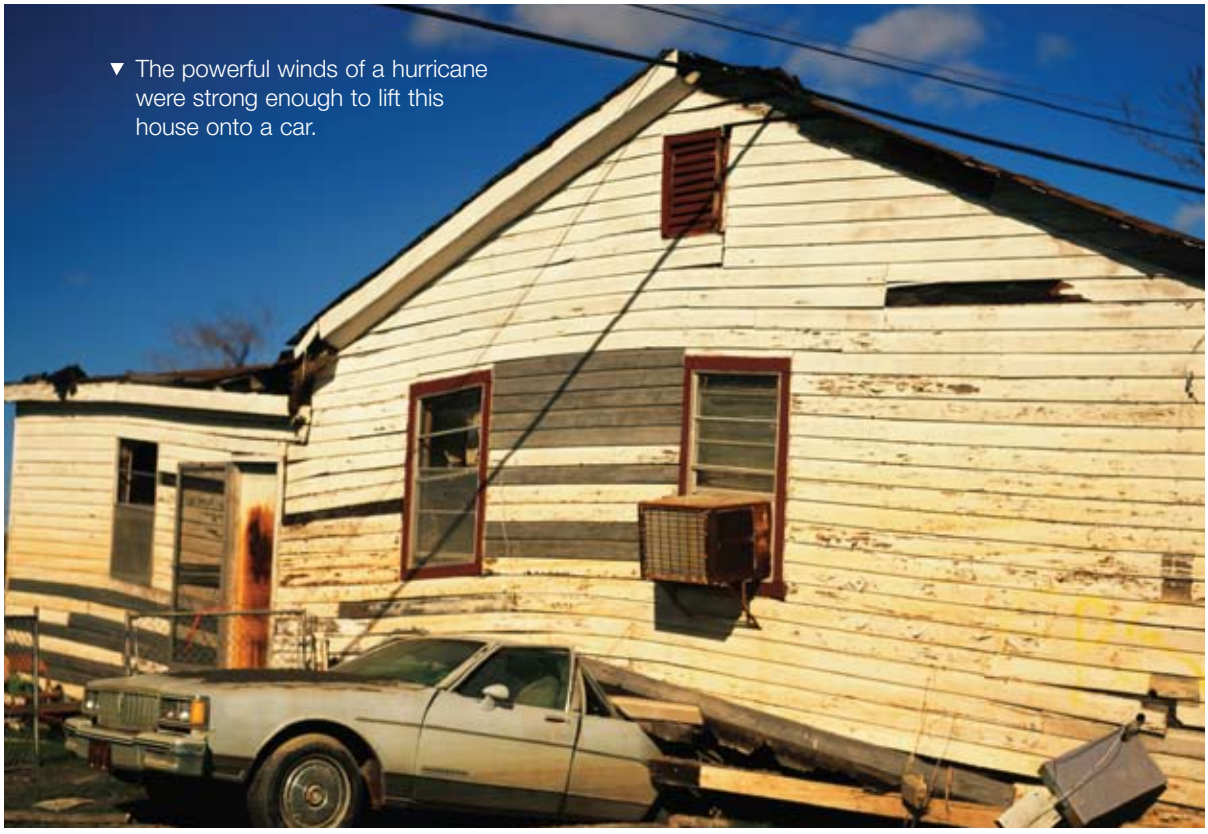
Birth of a Giant

We know that tropical cyclones begin over water that is warmer than 27 degrees Celsius (80 degrees Fahrenheit) slightly north or south of the earth's equator. Warm, humid air full of water vapor[1] moves upward. The earth's rotation causes the growing storm to start to rotate around its center (called the **eye**). At a certain height, the water vapor condenses,[2] changing to liquid and releasing heat. The heat draws more air and water vapor upward, creating a cycle as air and water vapor rise and liquid water falls. If the cycle speeds up until winds reach 118 kilometers per hour, the storm qualifies as a tropical cyclone.

[1] Water in the form of gas is called **water vapor**.
[2] When a gas or vapor **condenses**, it changes into a liquid.

Storm Surge

Most deaths in tropical cyclones are caused by **storm surge**. This is a rise in sea level, sometimes seven meters or more, caused by the storm pushing against the ocean's surface. Storm surge was to blame for the flooding of New Orleans in 2005. The storm surge of Cyclone Nargis in 2008 in Myanmar pushed seawater nearly four meters deep some 40 kilometers inland, resulting in many deaths.



▼ The powerful winds of a hurricane were strong enough to lift this house onto a car.

Difficult to Predict

The goal is to know when and where the next tropical cyclone will form. "And we can't really do that yet," says David Nolan, a weather researcher from the University of Miami. The direction and strength of tropical cyclones are also difficult to predict, even with computer assistance. Three-day forecasts are still off by an average of 280 kilometers. Forecasters do know that storms are often energized where ocean water is deep and warm, that high waves tend to reduce their force, and that when tropical cyclones move over land, they begin to die.

Long-term forecasts are poor; small differences in the combination of weather factors lead to very different storms. More accurate forecasting could help people decide to evacuate[3] when a storm is on the way. "People often return after an evacuation to find nothing really happened," says storm researcher Sharan Majumdar. "The solution is to improve forecasting through better science. That's the only way to get people to trust the warnings."

[3] If people **evacuate** a place, they move out of it because it has become dangerous.