Hurricanes Essay, Research Paper

What is a hurricane? A hurricane is a tropical cyclone that has a maximum sustained wind of at least 75 mph. The primary energy source for tropical cyclones is the latent heat released when water vapor condenses. Only extremely moist air can supply the energy necessary to spawn and maintain tropical storms, and only very warm air contains enough moisture. Tropical cyclones, therefore, form only over oceans with water temperatures of at least 80 deg F. After they have formed, such storms tend to intensify when passing over warmer water and weaken when passing over colder water.

The rate of condensation heating resulting from the intense rainfall associated with hurricanes is about 100 billion kW. In one day, therefore, a hurricane produces 24 X 100 billion kW h, an amount of energy that lies within the range of the yearly consumption of power by many industrialized nations. The mature hurricane is characterized by an eye–a cloud-free circular region of relatively light winds in the center of the storm. The sinking motion in the eye, which causes the clearing, also produces adiabatic warming and drying. Temperatures at 3 mi above sea level are typically 18 deg F warmer than the hurricane’s environment.

Surrounding the eye, which has a diameter of 6 to 60 mi, the winds in the eyewall rotate counterclockwise at maximum velocity, which may exceed 180 mph in the most severe storms. These winds are maintained by the large differences in horizontal pressure between the eye and the outer region of the storm. Although the winds themselves are responsible for much of the storm damage, the waves and tides generated by the wind often cause most of the damage to coastal areas. In hurricane Camille (1969), for example, the storm surge produced a tide 25 ft above normal as it made landfall near Pass Christian, Miss. Because much of human activity near the coast is concentrated within a few meters above mean sea level, storm surges can result in considerable loss of life and property. The winds reach their maximum velocity at a radius of 6 to 60 miles from the storm center and diminish rapidly with increasing distance. A radius of 300 mph, wind speed is usually less than 18 mph. The heaviest precipitation occurs under the intense convection in the eyewall. Thunderstorms may produce rainfall rates of 10 inches a day. The release of latent heat associated with this rain maintains low pressure and strong winds.

The rapidly whirling movement of hurricane winds can be explained by the conservation of angular momentum. Just as ice skaters spin faster as they bring their arms down, closer to the axis of rotation, so the air rotates faster as it is pulled in toward the center of the storm by the low pressure. Without friction, the wind would increase as the inverse of the distance from the center. Thus, a wind rotating at 3 mph at a radius of 300 mi would have a velocity of 160 mph if it reached a radius of only 6 mi. Friction reduces the predicted speed somewhat, but the basic principle explains the high rotational velocities near the center of the storm.

The air that spirals toward the center and rises in the intense convection in the eyewall turns outward in the upper troposphere (about 10 mi above sea level). As the air moves away from the center, its counterclockwise rotation slows, in accord with conservation of angular momentum. At a distance of about 190 mi from the center, the air acquires a clockwise rotation.

Hurricanes move with the large-scale wind currents in which they are embedded. The typical speed is 16 mph, but some storms may race along at twice this speed and others can remain stalled in the same location for several days. Typical tracks are from east to west at low latitudes. As the storms approach the continental landmasses, they usually begin to take a more northerly tack. As they reach higher latitudes and come under the influence of the westerlies, they usually turn toward the northeast, often missing the continents. This turn, the northeast, is called recurvature.

Until 1944, when hurricane exploration by aircraft became common, detection of hurricanes was based entirely on surface reports of land stations or ships, and some small storms probably went unnoticed. Although aircraft reconnaissance has considerably improved the ability to detect and monitor tropical storms, the greatest advance in early detection has been the continuous surveillance maintained by the series of geosynchronous satellites stationed over fixed points on the equator.

Hurricanes are not only dangerous they can sometimes be very costly. Like Hurricane Andrew that hit southern Florida and Louisiana in 1992 the total cost on damage was $30.5 billion dollars. That was the most costly hurricane in history. The next one was Hurricane Hugo that hit South Carolina in 1989. It cost $8.5 billion dollars. The most deadly hurricane recorded in history hit in Galveston, Texas in 1900. It was a category 4 hurricane, and killed around 8,000 people. In second and third place comes Florida. Combine together the grand totals of deaths are around 2,500 people. Just think we are in Florida. Florida also receives the strongest hurricane in history also. Remember to take caution when a hurricane threatens to approach. Always be on the caution and be ready for a storm to pop up.

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