The Structure

The dominant cloud in the hurricane is the cumulonimbus. The cyclone eye is surrounded by a spectacular wall of cloud extending in a steep slope to the upper rim at an altitude of 10 or more kilometres.

Inside the eye wall is the maximum speed ring, where the winds may exceed 300 km/h and towering cumulonimbus clouds produce torrential rainfall and thunder activity. The strongest winds in a hurricane are found on the right side of the storm because the motion of the hurricane also contributes to its swirling winds. Hurricane force winds can extend outward to about 40 km in a small hurricane and to more than 242 km for a large one.

The rain areas which can often be detected by radar, are arranged in bands which spiral in towards the centre of the system. These are commonly referred to as "spiral bands" or "rain bands". Decreases in rainfall rates and intensity occurs from this region outward.

The Effects of Hurricanes

The destructive effects of a hurricane depend on a number of factors, these include the following; the other weather systems with which they interact, the strength of the storm, where they strike, the nature of structures encountered, their speed of movement, the intensity and amount of rainfall, and the associated storm surge.

Storm surge is a large dome of water often 80 to 160 km (50-100 miles) wide that sweeps across a coastline where a hurricane makes landfall. Along the immediate coast, storm surge is the greatest threat to life and property.

Widespread torrential rains, often in excess of 150 millimetres can produce destructive floods. This is the major threat to inland areas. Hurricane force winds 118 km/h or more can destroy property and infrastructure.

The Saffir-Simpson Hurricane scale (see figure 2), is a 1 to 5 rating (5 being the highest) based on the hurricane's intensity. This is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall (when the hurricane strikes land).

Category	Winds (km/h)	Storm surge (m) above nor- mal	Damage
1	118-153	1.22-1.52	Minimal
2	154-177	1.83-2.44	Moderate
3	178-209	2.74-3.66	Extensive
4	210-249	3.96-5.49	Extreme
5	>249	More than 5.49	Cata- strophic

Figure 2. The Saffir-Simpson hurricane scale



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References: International Meteorological Vocabulary: W.M.O (1992)

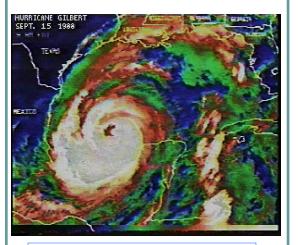
- : Meteorology Today- C. Donald Ahrens 1994)
- : Hurricanes,: The Greatest Storms on Earth—NOAA(1996)
- : Tropical Meteorology— Selvin Burton (1999)



Meteorological Service, Jamaica.

Hurricanes

Formation,
Structure and
Effects.



Satellite Imagery of Hurricane Gilbert. This was one of the strongest hurricanes ever seen in the Atlantic, Caribbean and Gulf of Mexico. Gilbert had winds up to 296 kilometres per hour and a barometric pressure of 888 mb, the second lowest pressure ever recorded for an Atlantic hurricane. It struck Jamaica on September 12,1988, and left a trail of devastation across the entire length of the Island.

FORMATION AND STRUCTURE

What is a Hurricane?

Tropical Cyclone is the general term for all circulating weather systems (anticlockwise movement in the Northern Hemisphere) over tropical oceans. A *Hurricane* is a tropical cyclone with maximum surface wind of 118 kilometres per hour (km/h) or greater in the North Atlantic, the Caribbean and the Gulf of Mexico. The same storms are termed Typhoons in the Western Pacific and simply cyclones in the Indian Ocean.

The Formation of Hurricanes

The formation of a tropical cyclone and its growth into a hurricane require a number of conditions. These are:

- A pre-existing weather disturbance containing abundant deep convection;
- Ocean temperature of at least 26.5°C to a depth of about 45 metres or greater;
- A location at least a few degrees away from the equator (more than 5°);
- Relatively light winds throughout the depth of the atmosphere (low wind shear);
- Favourable upper atmospheric conditions in close proximity to the disturbance.

When the disturbance reaches tropical oceans, if the conditions are present, surface convergence (inward funneling of air) and rising motion begin to form a low pressure circulation. Moist air spirals in towards the center of the disturbance. As the water vapor condenses in the rising air, heat is released and vertical motions are intensified. As a result, the surface pressure falls and winds intensify. When sustained winds reach 37 km/h, the disturbance is classified as a **tropical depression**.

If divergence (outflow of air) develops in the upper air, the intensification is greatly enhanced. This divergence vents the rising air outward and strengthens the vertical motions near the surface. The pressures fall and the winds increase. The transport of water vapor into the storm and subsequent release of latent heat in the rising air, also increase as a result of the stronger winds. If winds reach 62 km/h then the depression is classified as a tropical storm and given a name, for ease of reference. The names alternate between male and female, and are assigned in alphabetical order. They are determined from lists made up several years in advance. If sustained winds manage to reach 118 km/h then the storm is upgraded to the status of a hurricane.

In general, tropical cyclones form in all ocean basins, except in the South Atlantic and the eastern South Pacific. Most of the hurricanes that affect Jamaica (Caribbean Islands) develop over the Eastern Atlantic. Tropical cyclones (Hurricanes) may move in any direction, however, very often they move westwards and slightly pole wards after they first form. The Hurricane Season is that portion of the year having a relatively high incidence of tropical cyclones. In the Atlantic, the Caribbean and the Gulf of Mexico, the Season runs from June 1 to November 30. The Average

season has 10 tropical cyclones (named storms), with six becoming hurricanes.

The Structure of Hurricanes

Hurricanes vary in size from 100 to 1500 kilometres in diameter, and are characterized by a usually circular mass of cloud, at the centre of which is the cloud free eye. Surrounding the eye is the eye wall and then a number of convective bands, which spiral in towards the centre of the storm (see fig.1). The lowest pressure occurs at the centre of the cyclone (the eye). This region is sometimes only a few kilometres in diameter and is characterized by light winds, no rain and often very little cloud.

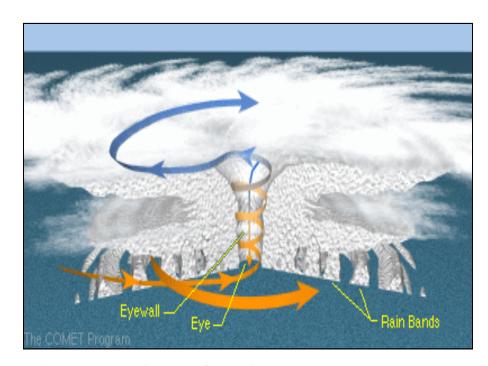


Figure 1. The Main parts of a Hurricane