

One Tropical Region: West Bengal

By The British Geographer

Aims

- To understand the basic climatic characteristics of one tropical region to include temperature, rainfall and wind.
- To understand the causes of these characteristics

Place Context

West Bengal is located in the East of India at the western border of Bangladesh. It has a varied physical environment with the mangrove swamps of the Sundarbans on its south coast, savannah –like plains in its interior and the rising Darjeeling Hills in the north, which stand in foothills of the Himalayas.

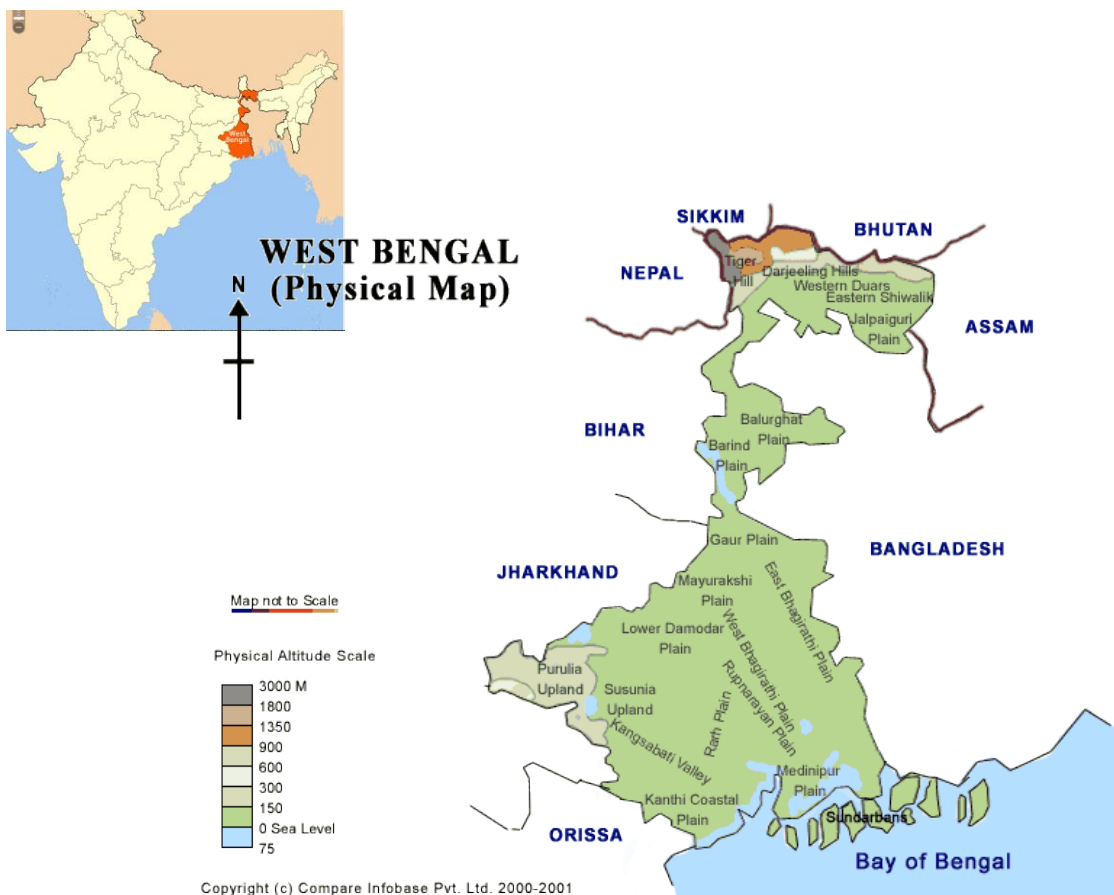


Figure 1

The Climate Calendar

West Bengal has a varied tropical climate. The plains are hot except during the short winter season. The mountainous region in the north is cold on account of its altitude but its humidity is high. There are four clearly marked seasons with a brief period of spring observed.

The hot season lasts from mid-March to mid-June, with the day temperature ranging from 38° C to 45° C in different parts of the state. At nights, a cool southerly breeze carrying moisture from the Bay of Bengal is usually present. The high temperature often causes troughs of low pressure to form on the plains, which are compensated by sudden brief storms known as *kal-baisakhi* or '*nor-westers*', accompanied by thundershowers. These summer storms can be quite destructive. The hills are pleasantly cool in the summer with the higher ground sometimes enveloped in heavy fog.

The monsoon arrives by a middle of June. Its *scouts* start arriving about two weeks before its normal onset. This is called the *Chhota Monsoon*, which breaks the intense heat of the summer. The monsoon rains in West Bengal are caused solely by the current of wind from the Bay of Bengal. During the dry season winds move in from over the continent and as a result pass over dry land. For the monsoon there is a wind reversal and warm moist air from the Bay of Bengal is drawn towards the intensely hot low pressure troughs of the plains.

The variability of the monsoon is a characteristic feature of the climate of West Bengal. Breaks in the continuity of rain are not unusual. The region is also impacted by cyclones that develop from low-pressure troughs within the Indian Ocean and Bay of Bengal.

By the end of September, the monsoon season comes to an end and autumn arrives. September in West Bengal is the season for festivity as this is the harvest time.

Winter lasts about three months and is mild over the plains, the average minimum temperature not falling below 15° C. It is influenced by a cold and dry northern wind, from the Himalayas, which substantially lowers the humidity level as it acts as a rain shadow. Winter is often a period of clouds and rain usually during the last week of December and the first week of January, caused by the influence of the Western Monsoon that brings moist air from the Arabian Sea. The cold is severe on the hills and there are sometimes sleet and snow on the higher reaches during the days of rain.

The weather gets warmer by the middle of February, which develops a brief spring season lasting only about a month, before the onset of intense rain arrives again as a result of the shifting ITCZ.

Climate Data

Figure 2 below shows the varied tropical climates of India. The only true Tropical Monsoon Climate is to be found on the western coastal margin. West Bengal is characterised by a Tropical Wet and Dry Climate that follows a band along its coastal region and a Humid Sub-Tropical Climate in the interior and north of the state.

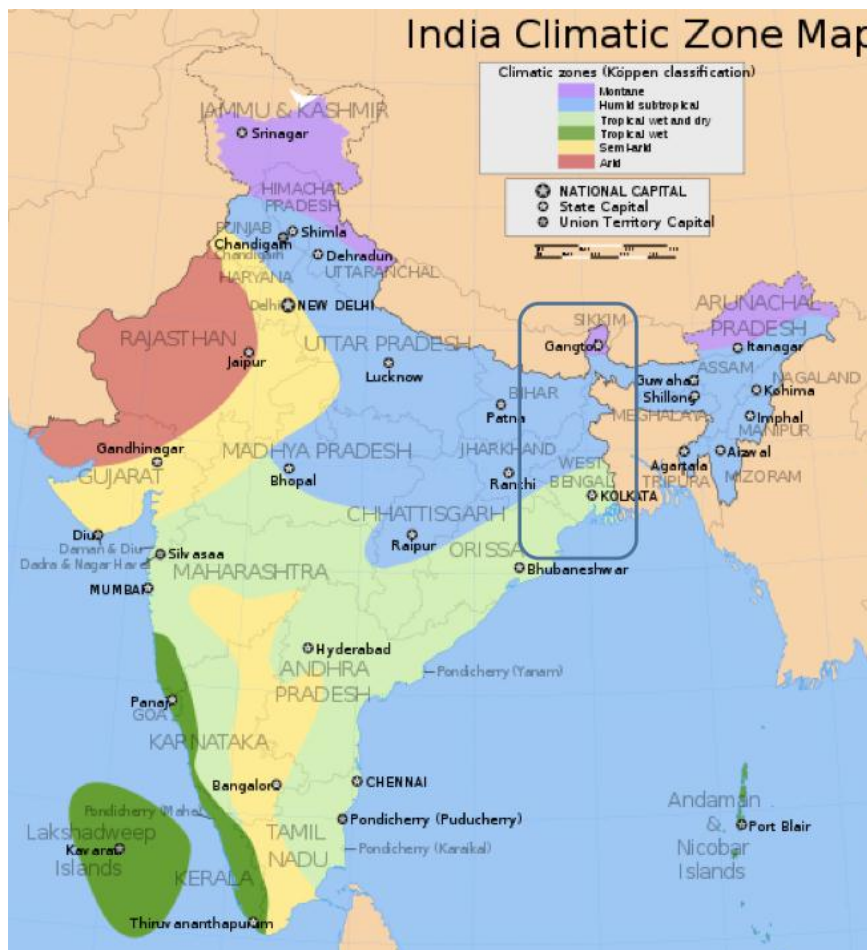
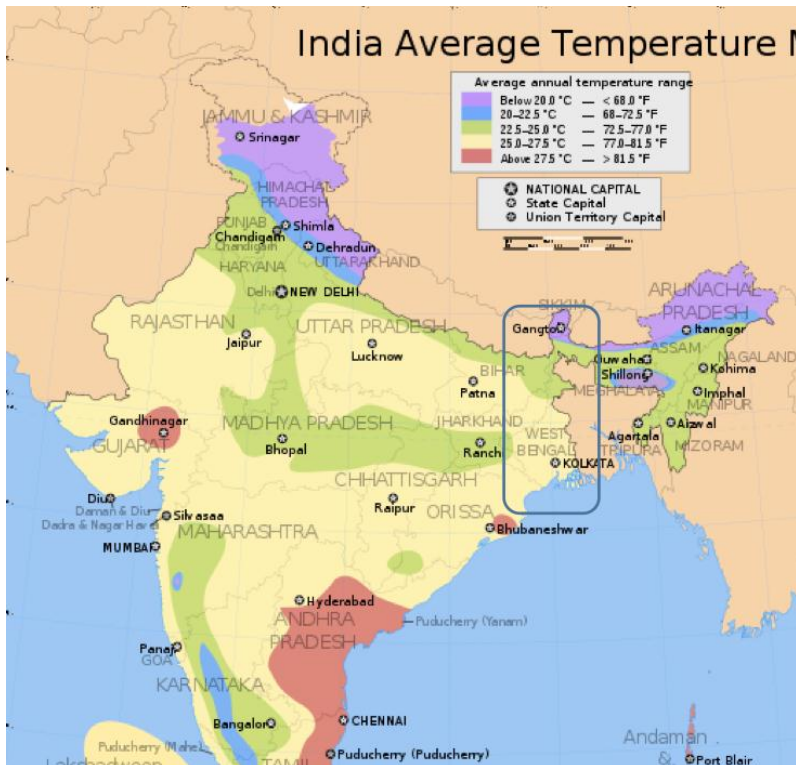


Figure 2

The only area that fully falls within the classification of tropical climates based on the Köppen Climate Classification is the coastal margin of West Bengal.

Average Temperature in West Bengal



Average temperature for West Bengal is of course misleading, as it doesn't show the variation that exists within the year. As you see from the map the average for the vast majority of west Bengal has a range between 22.2 and 27.5 °C, with the coastal region that has a Tropical Wet and Dry Climate ranging from 25-27.5 °C. The following data shows the average.

Figure 2

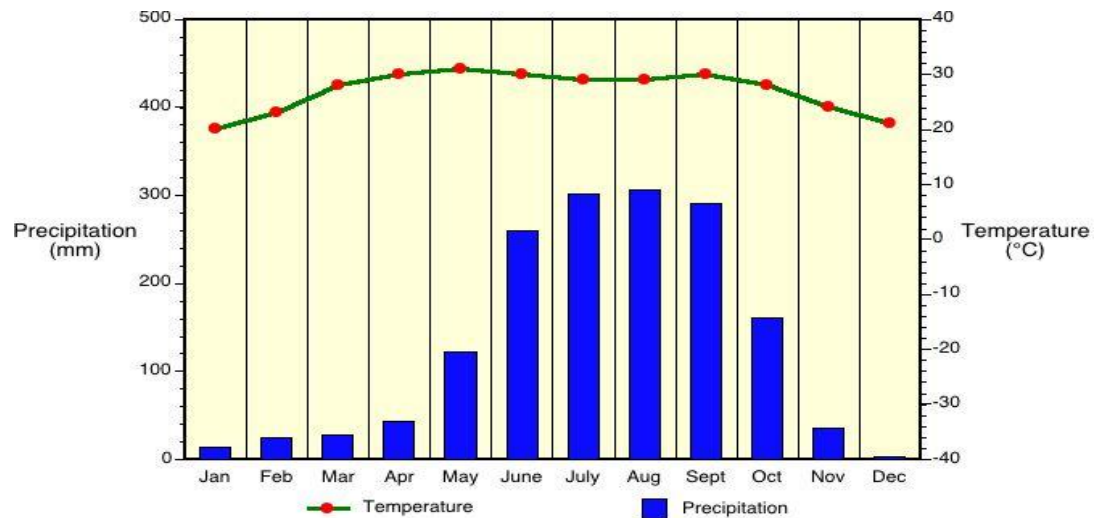


Figure 3

Figure 3 shows the climate graph for Calcutta. As you see average temperature doesn't fall below 19°C and rises to 29°C. Rainfall follows a very distinctive dry and wet seasonal change.

West Bengal Rainfall

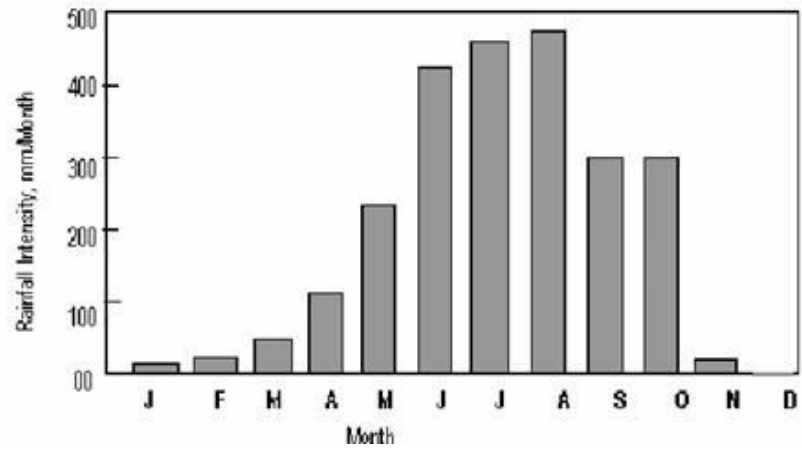


Figure 4

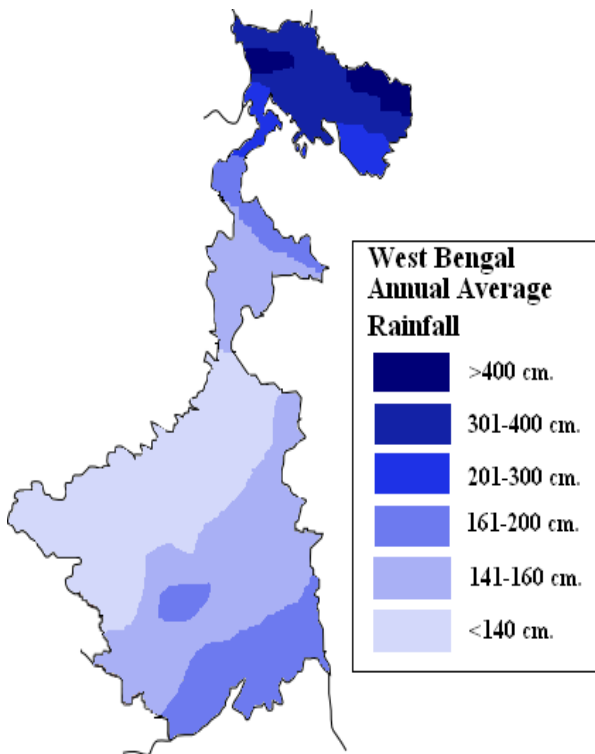


Figure 5

There are two clear rainfall gradients that can be seen in the rainfall map in figure 5. The first moves northwards from the coastal margin and the second moves southwards from the Darjeeling Hills. The Tropical Wet and Dry Climate of the coastal region of West Bengal receives on average between 161-299 cm of rain per year. The wettest region unsurprisingly is in the far north. A combination of relief rainfall and the monsoon-wet season help deliver over 400 cm of rain per year. Figure 4 above shows the variation in rainfall throughout the year. It is clear to see the characteristic wet and dry season.

The Wet Season (Monsoon)

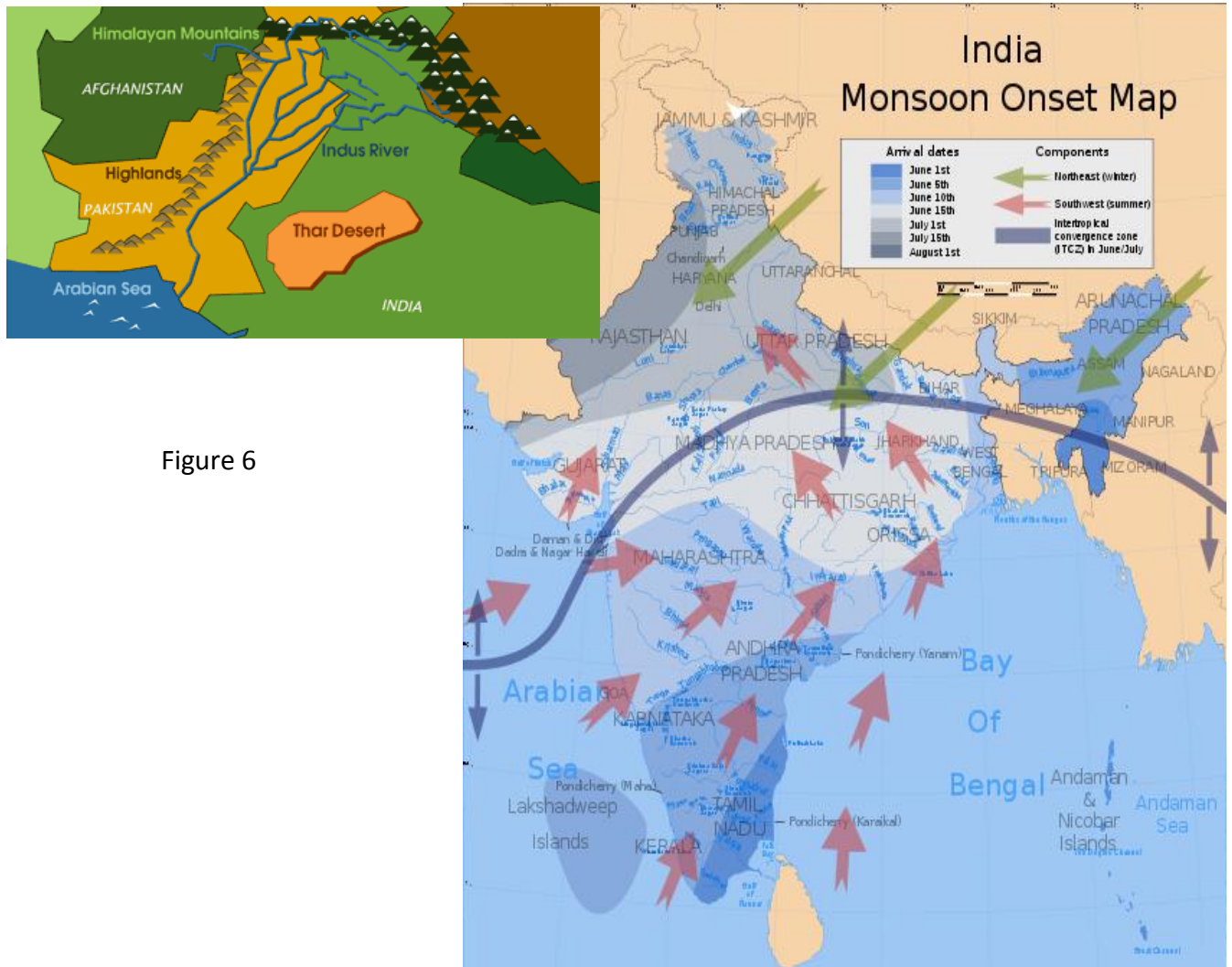


Figure 6

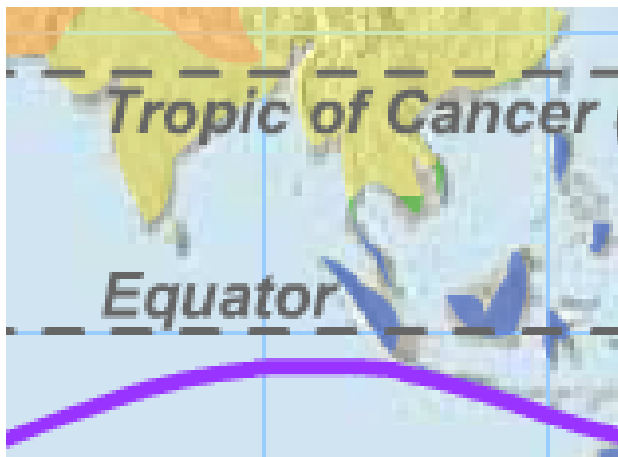
Figure 6 shows the passage of moving moist air from the Indian Ocean in the direction of the ITCZ. As you can see, air moves in from the Bay Bengal along the Indian coastline before shifting to the west and moving across West Bengal. This passage of warm air is saturated with moisture that has evaporated from the warm Indian Ocean. As it moves across the land it is forced to rise and as it cools and condenses it drops a huge quantity of water over India. It is this movement of air that delivers the wet season in West Bengal through the summer months. The image in the left corner of the figure shows the Thar Desert, located close to the Pakistan border. It is the Thar Desert and its surrounding plains that generate the immense interior heat and low-pressure trough that draws in the monsoon winds in June. In late December, early

January monsoon rains move in from the Arabian Sea, having travelled the whole breadth of India to reach West Bengal.

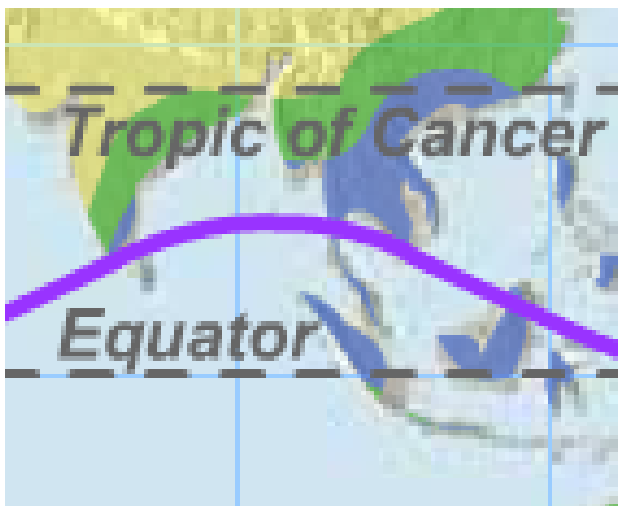
The following figure shows the shift in the location of the ITCZ over West Bengal throughout the year. It is this shift in ITCZ that determines the pattern of changing dry and wet seasons in West Bengal.



Mid July



Mid December



Mid March

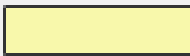



Monthly precipitation (mm)	
	< 25
	25 - 50
	50 - 150
	> 150

Figure 7

Cyclones

The final factor influencing the climate of West Bengal is cyclones. Cyclones are intense tropical storms resulting from rapid convectonal processes that develop over warm ocean water with temperature of over 26.5 and extending to depths up of 50 meters. The cyclone season in West Bengal occurs twice yearly from April to June and September to November.

Tropical Cyclones first develop as a cluster of tropical depressions around a low-pressure trough in the Indian Ocean. As a result of the Coriolis Effect and the converging winds at the ITCZ tropical cyclones move inwards and impact the climate of West Bengal and its neighboring country of Bangladesh

Depending on the maximum sustained wind speed, tropical cyclones will be designated as follows:

- a tropical depression when the maximum sustained wind speed is less than 63 km/h
- a tropical storm when the maximum sustained wind speed is more than 63 km/h
- a tropical cyclone when the maximum sustained wind speed is more than 119 km/h

Tropical cyclones can be hundreds of kilometers wide and can bring destructive high winds, torrential rain, storm surge and occasionally tornadoes. According to the Saffir-Simpson Hurricane Wind Scale, the hurricane strength varies from Category 1 to 5

Category	Wind Speed (mph)	Damage at Landfall	Storm Surge (feet)
1	74-95	Minimal	4-5
2	96-110	Moderate	6-8
3	111-130	Extensive	9-12
4	131-155	Extreme	13-18
5	Over 155	Catastrophic	19+

Figure 8: Source NASA

The following figure shows a cross section of a typical tropical Cyclone

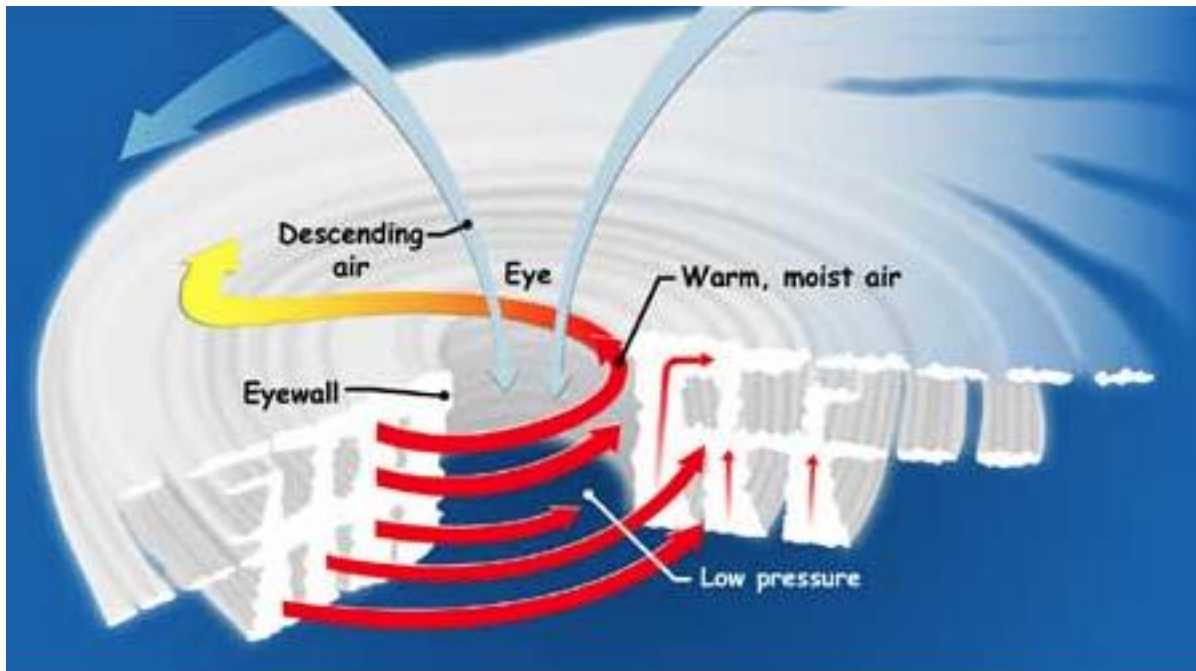


Figure 9: Source: NASA