

Hurricanes Around the Globe

- Hurricanes are most likely to be observed along the western portion of the oceanic basins.

Hurricane Characteristics

- A hurricane is defined as a tropical low pressure with sustained winds of 74 mph or greater.
 - Sea level pressures near the center of a typical hurricane is around 950 mb.
 - Sea level pressures of around 870 mb have been observed for the most extremely powerful hurricanes.
 - The weakest hurricanes have central pressures around 990 mb.
- Hurricanes receive most of their energy from the latent heat released by condensation.
- In the Northern Hemisphere, the most active hurricane months are August and September.
- Hurricanes are an amalgamation of thunderstorms arranged in a 'pinwheel' formation.
- The wind speed and intensity of precipitation both increase toward the center of the storm.
- Hurricanes attain their high wind speeds through extreme horizontal pressure gradients.
- Hurricanes do not have any type of fronts attached to them.
- Air in the lower levels of a hurricane flows cyclonically, while in the upper levels flows anticyclonically from its center.
- A hurricane's 'eye' is a region of relatively clear skies, descending air, and nearly calm winds.
 - The smaller the eye, the stronger the hurricane.
- Surrounding the 'eye' is the 'eye wall', where the most destructive winds in a hurricane are located.

Hurricane Formation

- Hurricanes begin as a rather small cluster of thunderstorms known as 'tropical disturbances'.
 - Characterized by small pressure gradients and a weak rotary circulation.
- Most tropical disturbances originate in easterly waves.
 - An 'easterly wave' is a ripple in the normal trade wind pattern.
- Tropical disturbances are located upwind of the wave axis of the easterly wave.

- The genesis for most tropical disturbances are located over sub-Saharan Africa.
- They move westward under the Azores High.
- They initially weaken as they pass over the Canary current off the coast of western Africa.
- When a tropical disturbance has at least one closed isobar on a weather map, it is called a tropical depression.
- If the tropical depression has winds of 39 mph or higher, it is called a tropical storm.
- In the latter half of 'hurricane season', the genesis area moves toward the Caribbean Sea.
- Several conditions need to be met in order for hurricanes to form.
 - The ocean must have a deep surface layer with temperatures at least 80°F.
 - It must be poleward of about 3° latitude.
 - No Coriolis force at the equator means tropical lows can't attain the rotary circulation necessary for hurricane formation.
 - Vertical wind shear cannot be strong otherwise the strongest thunderstorms are not co-located with the low level circulation.



Hurricane Movement and Dissipation

- Tropical disturbances and depressions are steered mainly by the trade winds and tend to move westward.
- Once they intensify into tropical storms and hurricanes, upper-level winds become more important in steering them and therefore tend to move more poleward.
- Tropical storms and hurricanes are extraordinarily rare off the west coast of the United States because of the cold current of water known as the California current that exists adjacent to the west coast of the United States.
- After hurricanes move inland (over a large land area), they weaken. The reasons are twofold.
 - Loss of evapotranspiration from the oceans which provides the fuel for the hurricane.
 - Increased friction from the land surface as opposed to the ocean, which disrupts the hurricanes circulation.
- Even after hurricanes weaken after moving inland, they still pose a great danger from inland flooding.
 - Just because the hurricane weakens, it doesn't mean the rainfall disappears.
 - The rainfall can even be enhanced inland if there are mountains inland which means there is increased orographic uplift.

Hurricane Destruction and Fatalities

- Many hurricanes contain tornadoes which are most likely to occur in the ‘right-front quadrant’. They also occur in the outer feeder bands of the storm (supercells).
 - These tornadoes are generally weak and short-lived.
- Hurricanes also produce ‘storm surges’.
 - A storm surge is defined as a rise in water level produced by a hurricane.
 - The main factor in the causation of storm surge is the piling up of water as strong winds push surface water forward.
- Hurricane winds are usually strongest in the right-front quadrant of the storm.
 - The reason this is the case is that the forward movement of the storm is in the same direction as the wind. As a result the hurricane’s wind speed and its forward movement are added together.

Hurricane Symbols on a Weather Map

- A ‘tropical depression’ on a weather map is depicted by a ‘L’.
- A ‘tropical storm’ is depicted by a red open circle with red tails on the top and bottom of the circle (Symbol: ).
- A ‘hurricane’ is depicted by a red-filled circle with red tails on the top and bottom of the circle (Symbol: ).

Hurricanes on Satellite Imagery

- When tropical storms and hurricanes approach land, they can be tracked via radar and reconnaissance aircraft. But when they are thousand of miles from land, how can their strength be ascertained?
 - The answer is through satellite estimates.
- Tropical depressions
 - On satellite they are represented by a broad, weakly defined circulation, with most of the thunderstorms displaced from the low-level center. Known for their asymmetry.
- Tropical Storms
 - Much more symmetric than tropical depressions.
 - Low-level circulation is in the center of the ‘central dense overcast’ (the heart of the storm).
- Hurricanes
 - An ‘eye’ will develop at approximately 90 mph strength.
 - For strong hurricanes, the eye will be equidistant from the circular edge of the hurricane (central dense overcast).
 - For severe hurricanes, on a satellite loop, it will take on a ‘buzz saw’ appearance.

Helpful Link:

<http://www.physicalgeography.net/fundamentals/7u.html>