

Severe Weather



TORNADO VS LIGHTNING

get out your camera, this should be interesting.

Outcomes:

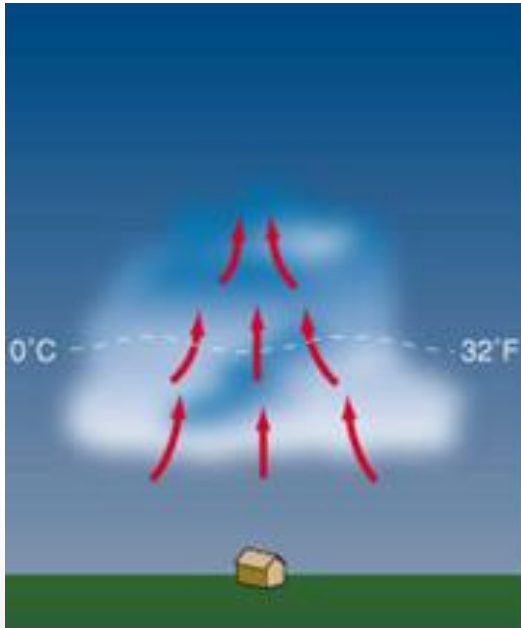
- S2-4-04 Explain the formation and dynamics of selected severe weather phenomena....
- S2-4-05 Collect, interpret, and analyze meteorological data related to a severe weather event.
- S2-4-06 Investigate the social, economic, and environmental impacts of a recent severe weather event.

Thunderstorms...

Stages in the development of a thunderstorm

Stage #1 – Cumulus Stage

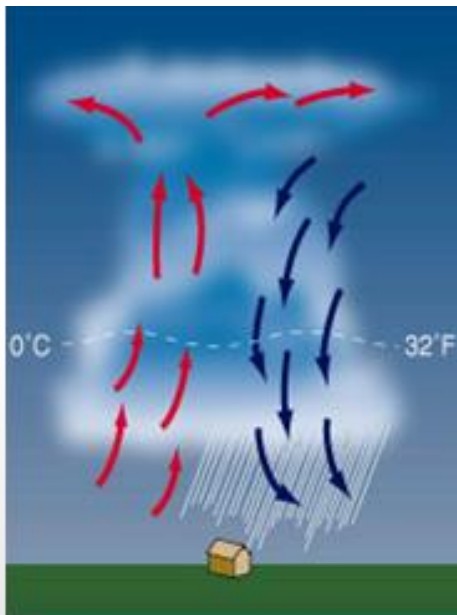
- The sun HEATS the earth's surface during the day.
- The HEAT on the surface and WARMS the AIR around it. Since warm air is lighter than cool air, it starts to RISE (known as an UPDRAFT).
- If the air is MOIST, then the warm air CONDENSES into a CUMULUS CLOUD.
- The cloud will continue to GROW as long as warm air below it CONTINUES to RISE.



Thunderstorms...

Stage #2 – Mature Stage

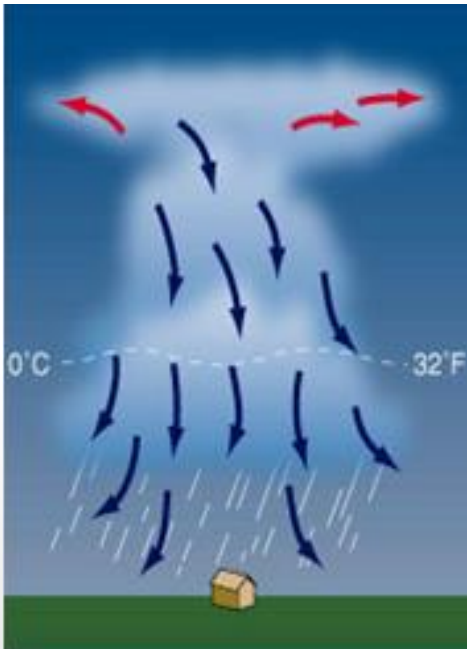
- As the **CUMULUS** cloud gets **BIGGER**, the amount of **WATER** in it gets large and **HEAVY** and starts to fall as the **RISING AIR** can no longer **HOLD** it up.
- **COOL DRY** air starts to enter the cloud and falls, creating a **DOWNDRAFT** that pulls the heavy **WATER** downward, making **RAIN**.
- This cloud has become a **CUMULONIMBUS** (*anvil*) cloud because it has an **UPDRAFT**, a **DOWNDRAFT**, and **RAIN**.
- **LIGHTNING AND THUNDER** start to occur, as well as **HEAVY RAIN**. The **CUMULONIMBUS** is now a **THUNDERSTORM CELL**.



Thunderstorms...

Stage #3 – Dissipating Stage

- After about **30 MINUTES**, the thunderstorm begins to **DISSIPATE** (weaken).
- This occurs when the **DOWNDRAFTS** in the cloud begins to **DOMINATE** over the **UPDRAFT**.
- Since **WARM** moist air can no longer **RISE**, cloud **DROPLETS** can no longer form.
- The storm **DIES OUT** with light **RAIN** as the cloud **DISAPPEARS** from bottom to top.



Thunderstorms...

Warm Air Rising

Formation of Lightning

Tornadoes...

- Tornadoes form when a **THUNDERSTORM** becomes an intense storm maintaining a highly organized **CIRCULATION** with a **CONTINUOUS TILTED** large **UPDRAFT**.
- Inside this “supercell” the interaction of winds of differing speeds produces a whirling motion, which becomes a **VORTEX** and then frequently a tornado.
- As air continues to rise **UPWARD**, the vortex spins **FASTER** and **FASTER**, and a funnel cloud forms.
- When a cloud like this **TOUCHES** the **GROUND**, it is then considered to be a **TORNADO**.



Classes of Tornadoes...

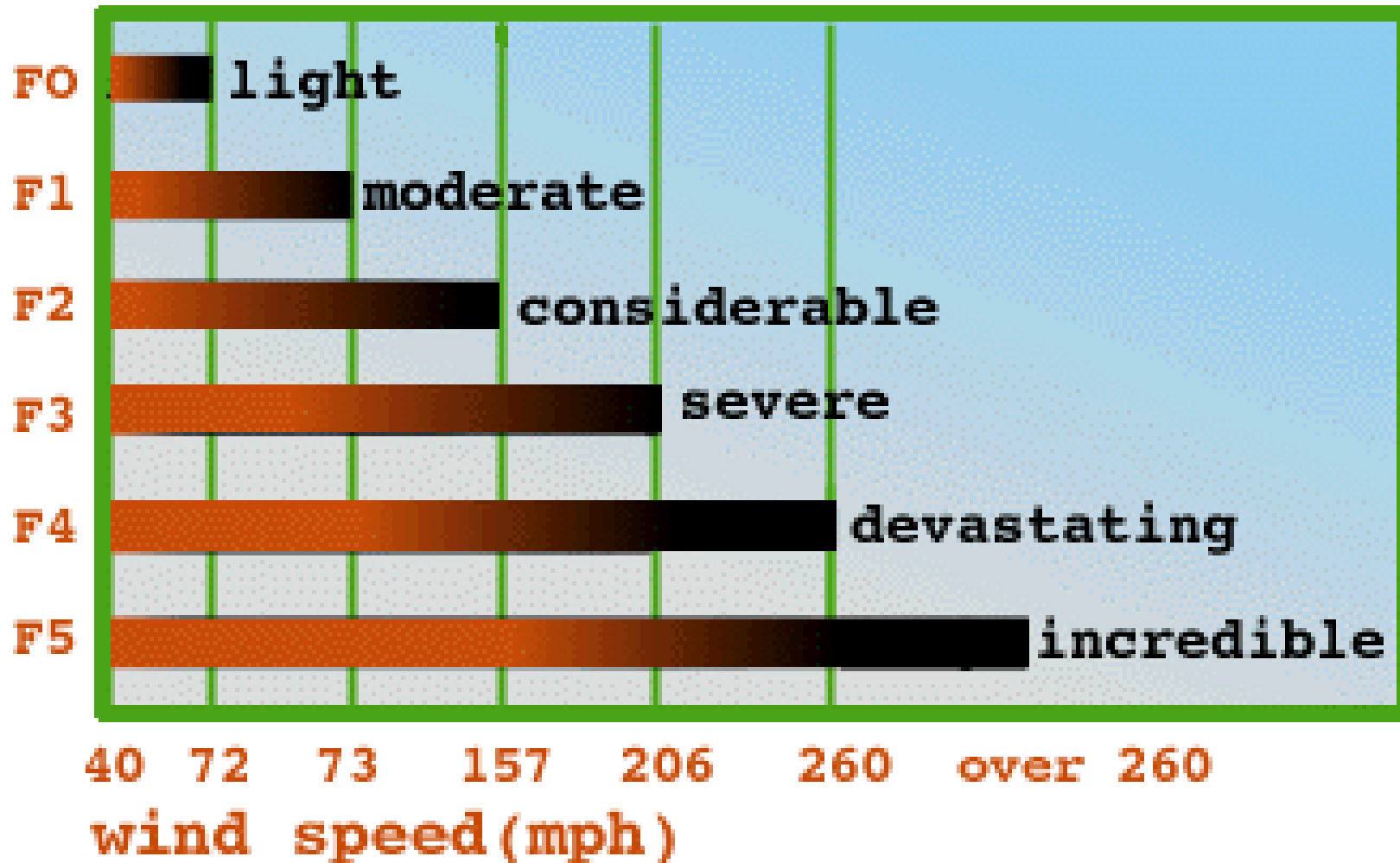
Main Types of Tornadoes

- Tornadoes are CLASSIFIED/MEASURED by the FUJITA SCALE.
- The Fujita Scale is used to RATE the INTENSITY of a tornado by examining the DAMAGE CAUSED by the tornado after it has passed over a man-made structure.
- The Fujita scale has values of F0 TO F6.

A key point to remember is this: the size of a tornado is NOT necessarily an indication of its intensity. LARGE tornadoes can be WEAK, and SMALL tornadoes can be VIOLENT.

Classes of Tornadoes...

Fujita damage scale



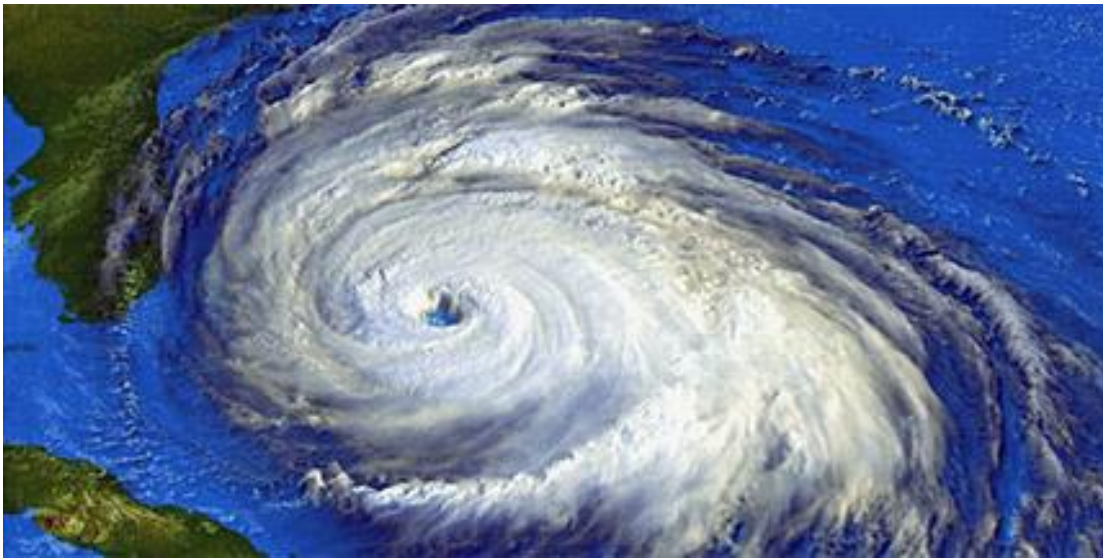
Classes of Tornadoes...

Table 10-1 Fujita Intensity Scale

Scale	Wind Speed		Expected Damage
	(KPH)	(MPH)	
F0	<116	<72	Light Damage Damage to chimneys and billboards; broken branches; shallow-rooted trees pushed over.
F1	116–180	72–112	Moderate Damage The lower limit is near the beginning of hurricane wind speed. Surfaces peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the road.
F2	181–253	113–157	Considerable Damage Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	254–332	158–206	Severe Damage Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.
F4	333–419	207–260	Devastating Damage Well-constructed houses leveled; structures with weak foundations blown some distance; cars thrown and large missiles generated.
F5	>419	>260	Incredible Damage Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air farther than 100 m; trees debarked; incredible phenomena occur.

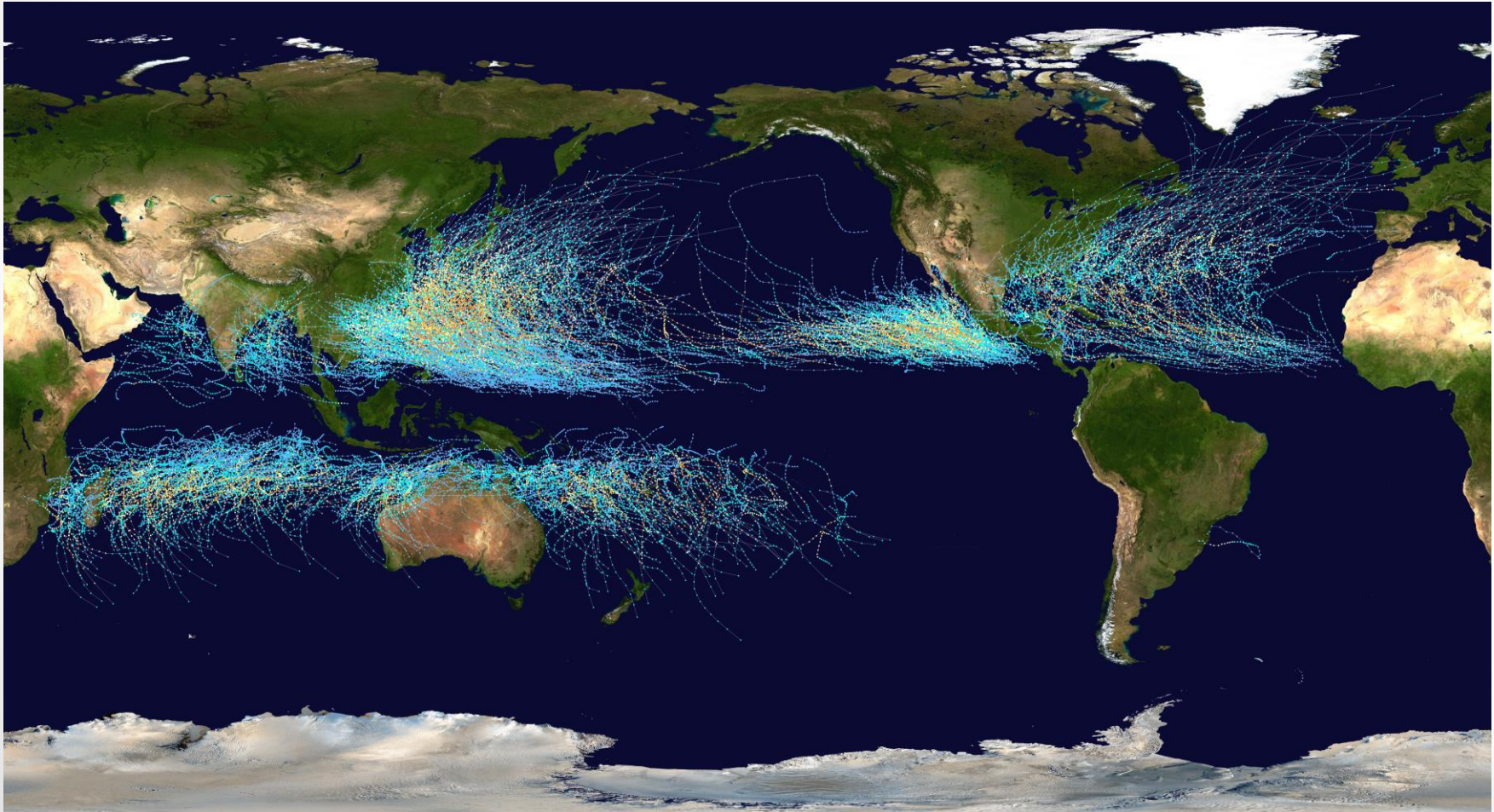
Hurricanes...

- A hurricane is an **INTENSE, ROTATING** storm system that forms over **WARM TROPICAL WATERS**
- Form in the **LATE SUMMER OR EARLY FALL.**
- Are **CIRCULAR** in shape, ranging from **300** to **1000** km across, with winds over **118 KM/H** within 50km of the center.
- Are formed by a **LOW-PRESSURE DISTURBANCE** over a large body of **WARM WATER**. The **EVAPORATION** of this water will **INTENSIFY** the resulting storm.
- If the storm is far enough from the **EQUATOR** the winds will **CIRCULATE** around a center of low pressure due to the **CORIOLIS FORCE**.



Hurricanes...

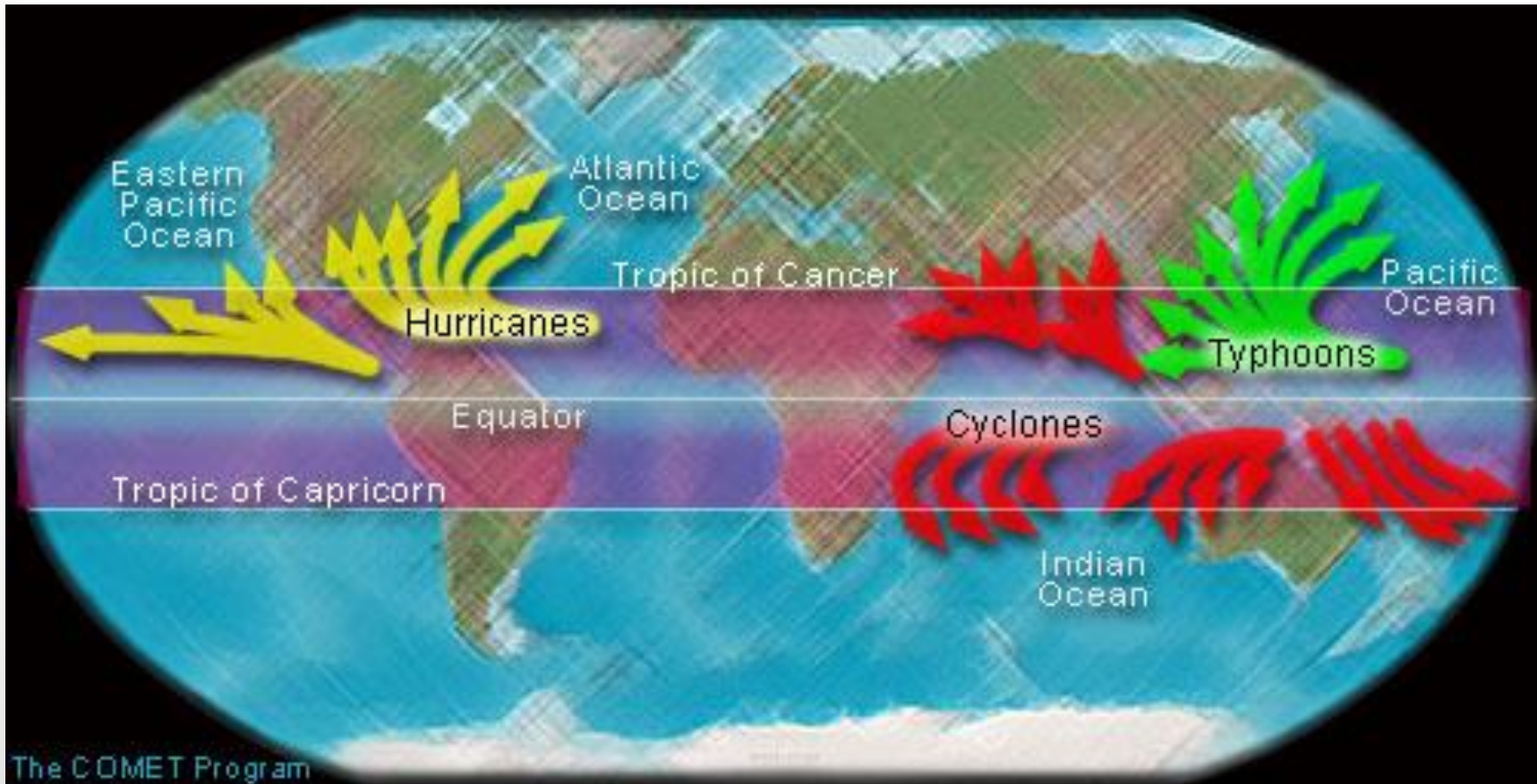
The Coriolis force is **TOO WEAK** near the **EQUATOR** to create the needed rotation



Paths of Hurricanes...

The **FORWARD MOVEMENT** of hurricanes is **SLOW**, typically 15 to 25 km/h in the lower latitudes.

Typical paths of motion of hurricanes, cyclones and typhoons:



Stages of Hurricane Development...

1. TROPICAL DISTURBANCE:

- The first stage is a COLLECTION of THUNDERSTORMS forming in the easterly flow over warm tropical waters with only slight rotation.

2. TROPICAL DEPRESSION:

- Next, the storm develops a WELL-DEFINED CENTRE OF LOW PRESSURE with winds of 37 to 62 km/h.

3. TROPICAL STORM:

- Next, the storm becomes an INTENSE CENTRE OF LOW PRESSURE and carries winds of between 63 and 117 km/h.

4. HURRICANE:

- When the wind speeds are 118 KM/H AND HIGHER, the storm is considered a hurricane.

Features of a Hurricane...

EYE:

- The major feature within a hurricane is the eye, a small region of relatively calm and clear air in the centre, 15 kilometres or so across.

EYEWALL :

- The eye is surrounded by clouds that make up the eyewall; here the weather is most severe with high winds and heavy precipitation.

SPIRAL RAIN BANDS:

- Feeding into the wall cloud region are spiral bands of clouds, often composed of strong thunderstorms.

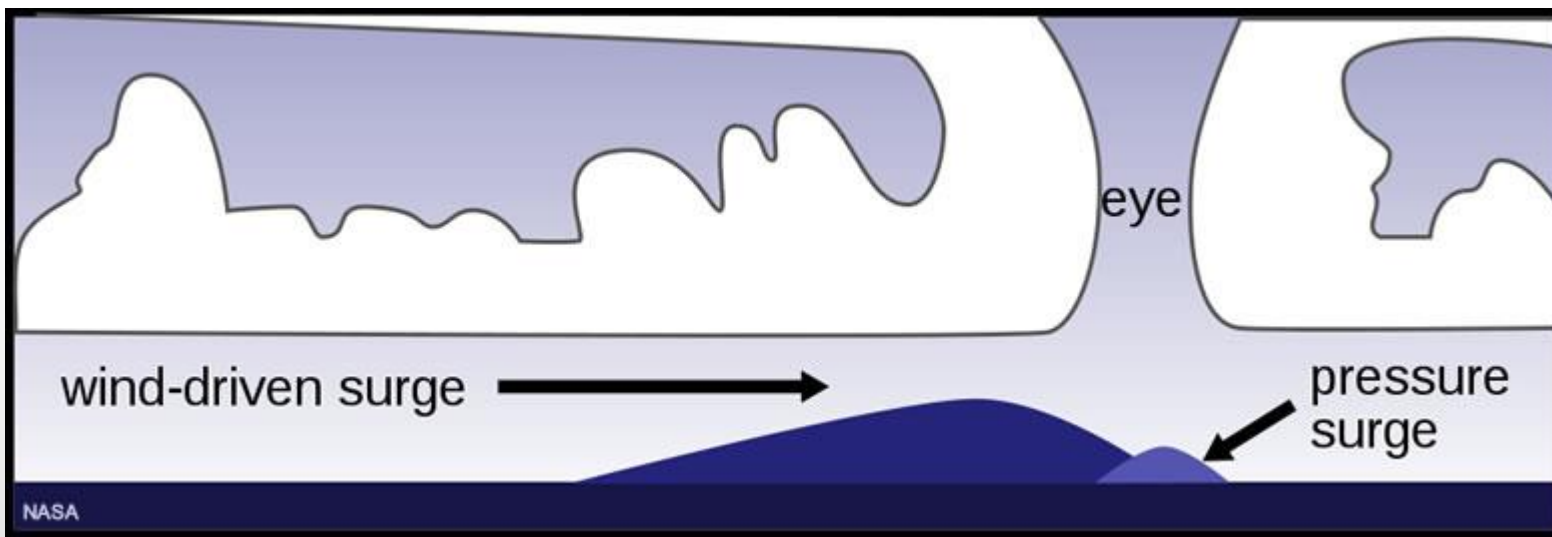


Damage from a Hurricane...

Hurricanes are especially damaging because of 2 things:

1. STORM SURGE:

- 90% of hurricane deaths are due to HIGH WATER rather than high winds.
- Due to the low pressure and strong winds, hurricanes create a HUGE MOUND OF WATER called a STORM SURGE (especially in shallow coastal waters)
- If the surge occurs during a high tide, the increase in water level can be as much as SIX METRES.
- Large-scale EVACUATIONS of people from low-lying areas prevent massive loss of life due to such flooding.



Damage from a Hurricane...

2. WIND DAMAGE:

- Hurricane winds have been recorded at speeds up to **300 KM/H**.
- Beyond the damage caused directly by such winds, wind-driven waves on top of the storm surge compound the flooding problem by battering and eroding coastal features.



Weather Warning Systems...

In order to lessen the impact severe weather can have, we have a warning system in place to help people make decisions with respect to weather:

Severe Weather Watch:

Conditions are present for extreme weather to occur in your area, so you should pay attention to further news updates.

Severe Weather Warning:

Extreme weather is highly likely to arrive somewhere in your area or may already be happening, so you should take appropriate precautions.

Lightening Bolt Calculation:

Every 3 seconds is equal to 1 km or 5 seconds is equal to 1 mile.