

Cyclonic Storms

A satellite image of Hurricane Hugo, showing a well-defined eye and a dense, swirling cloud structure. The storm is positioned over the Atlantic Ocean, with the eastern coast of North America visible in the lower-left quadrant. The colors in the image represent different cloud heights and temperatures, with warmer colors (yellow and red) indicating higher, warmer clouds and cooler colors (blue and purple) indicating lower, cooler clouds.

Hurricane Hugo

2:44 p.m. EDT
September 21, 1989

Tropical Cyclone

A tropical cyclone is a **rapidly rotating storm system** characterized by a **low-pressure center**, **strong winds**, and a spiral arrangement of thunderstorms that produce **heavy rain**.

- Formed from *organized groups of thunderstorms*.
- Classified depending on its location and strength:
 - Cyclonic storm (general term)
 - Tropical Depression
 - Tropical Storm
 - Tropical cyclone (Southern Hemisphere and Indian Ocean)
 - Typhoon (Northwestern Pacific)
 - Hurricane (Northeast Pacific or North Atlantic)

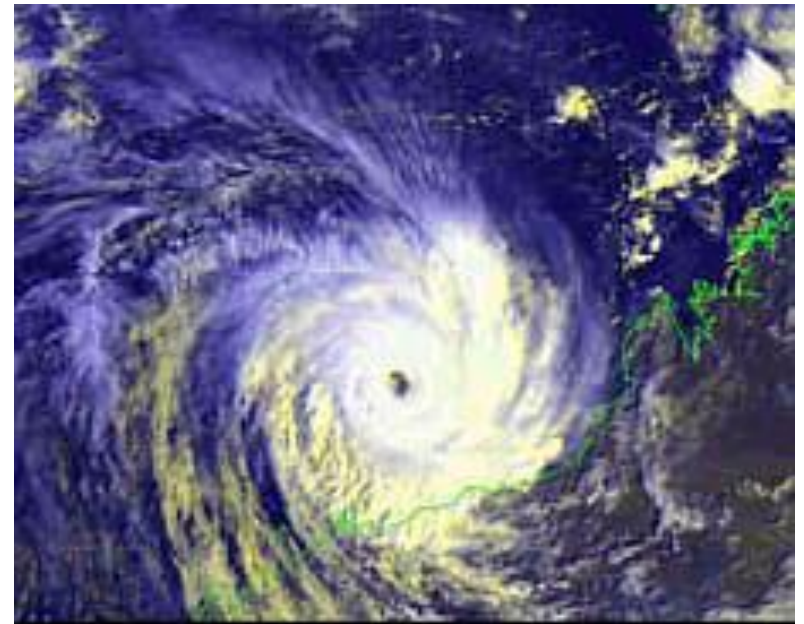


Winds, Pressure, Rotation

- “Hurricane strength” wind speeds **> 74 mph**.
- Barometric pressure inside a cyclonic storm is **LOW**.
- In which direction does a cyclonic storm rotate?

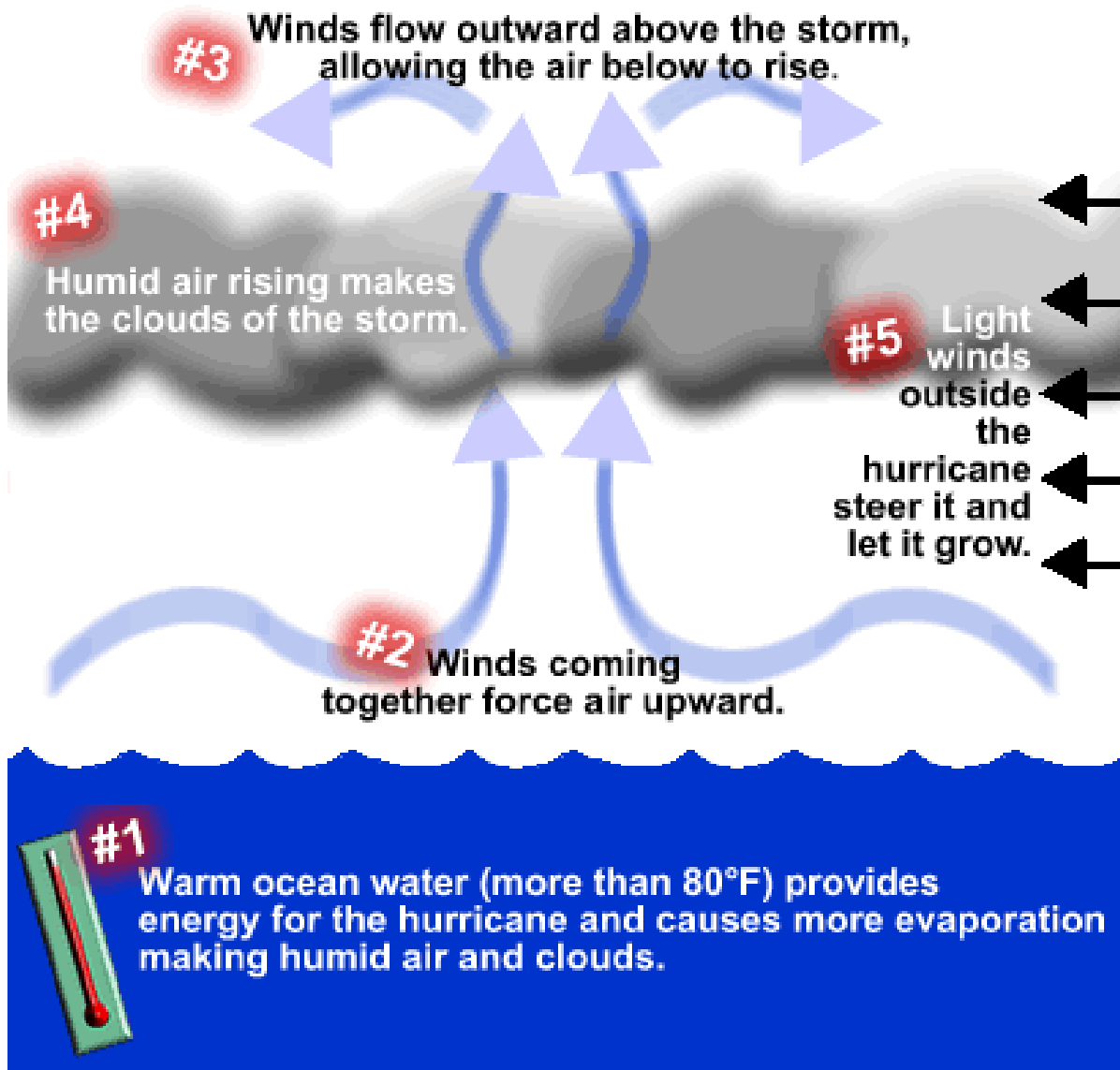


COUNTERCLOCKWISE
in **Northern** Hemisphere



CLOCKWISE
in **Southern** Hemisphere

Ingredients of a Cyclonic Storm



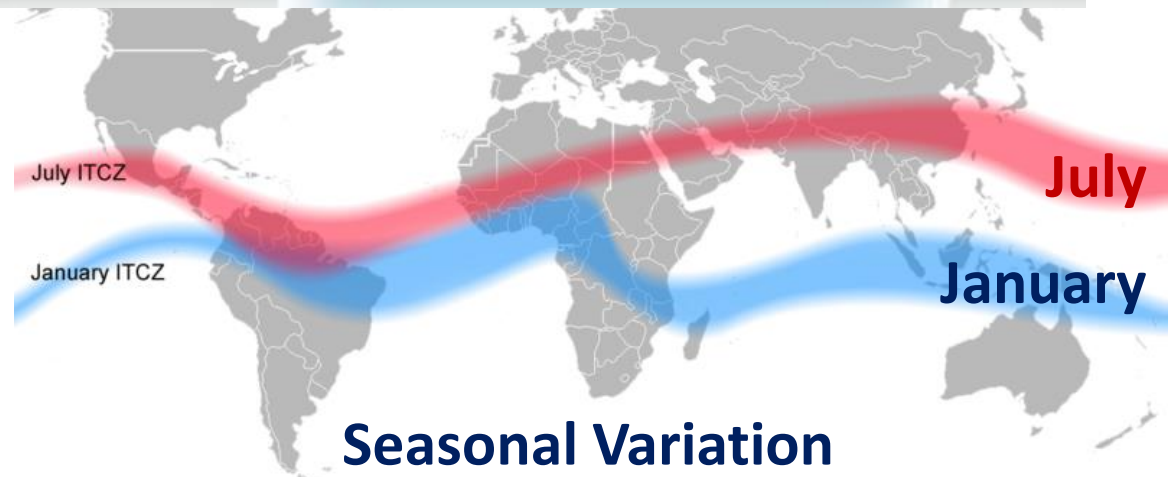
- **Warm water**
(at least 26.5°C/
79.7°F are needed
down to a depth of
at least 50 m/ 160 ft)
- **Time to grow**
- **Conditions
to develop
circulation**
(location off equator)
- **Light upper
level winds**
(wind shear destroys
thunderstorm
organization)

Where are Hurricanes Forming?

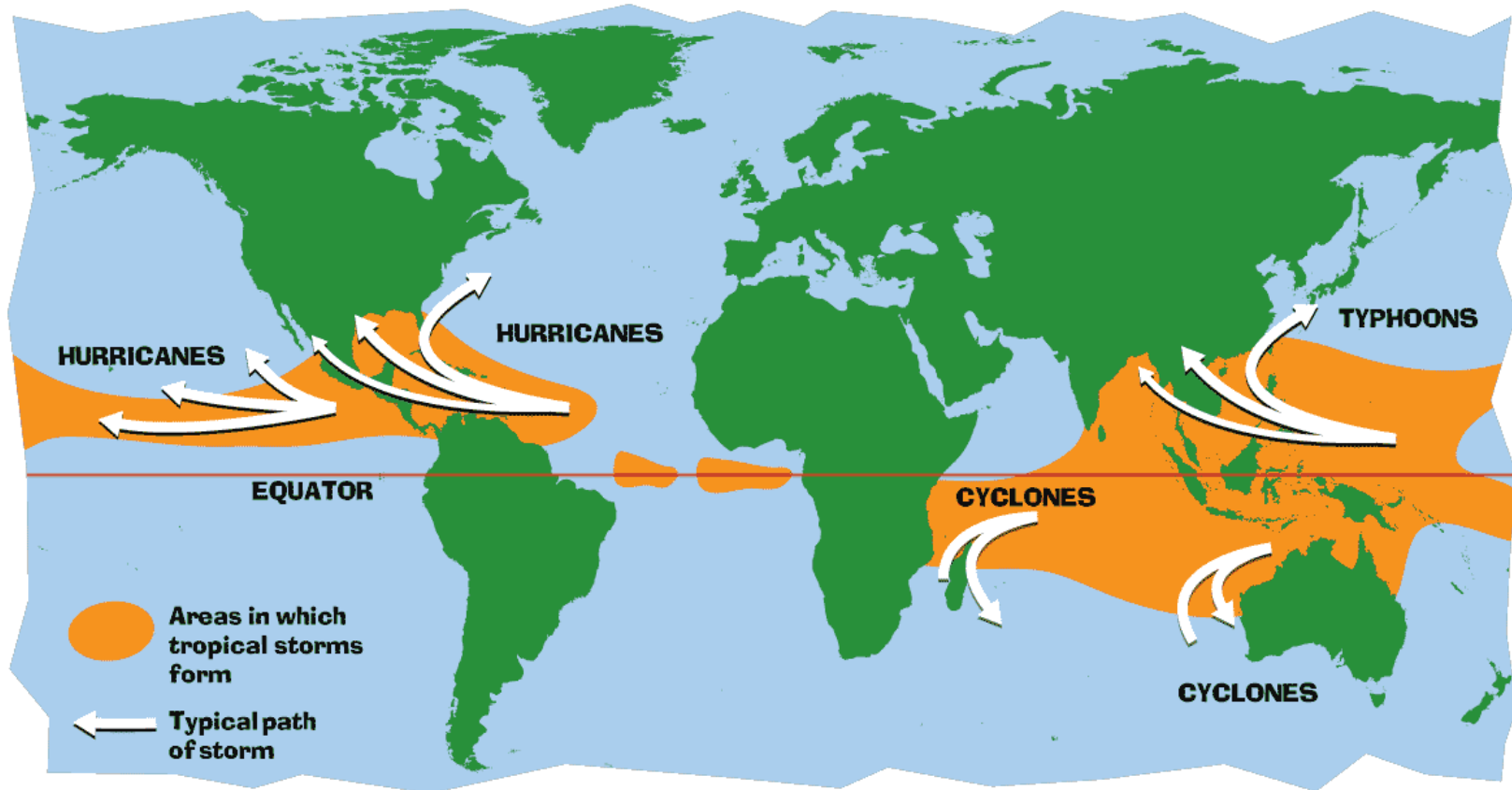
InterTropical Convergence Zone (ITCZ)



Area of low pressure near the Equator, a worldwide band of thunderstorm activity.



Formation and Typical Paths



The majority of cyclonic storms **form between 10 and 30 degrees** of latitude away of the equator:

- **87%** between **10-20 degrees north or south**,
- **rarely** form or move **within 5 degrees of the equator** where Coriolis effect (responsible for storm rotation) is low.

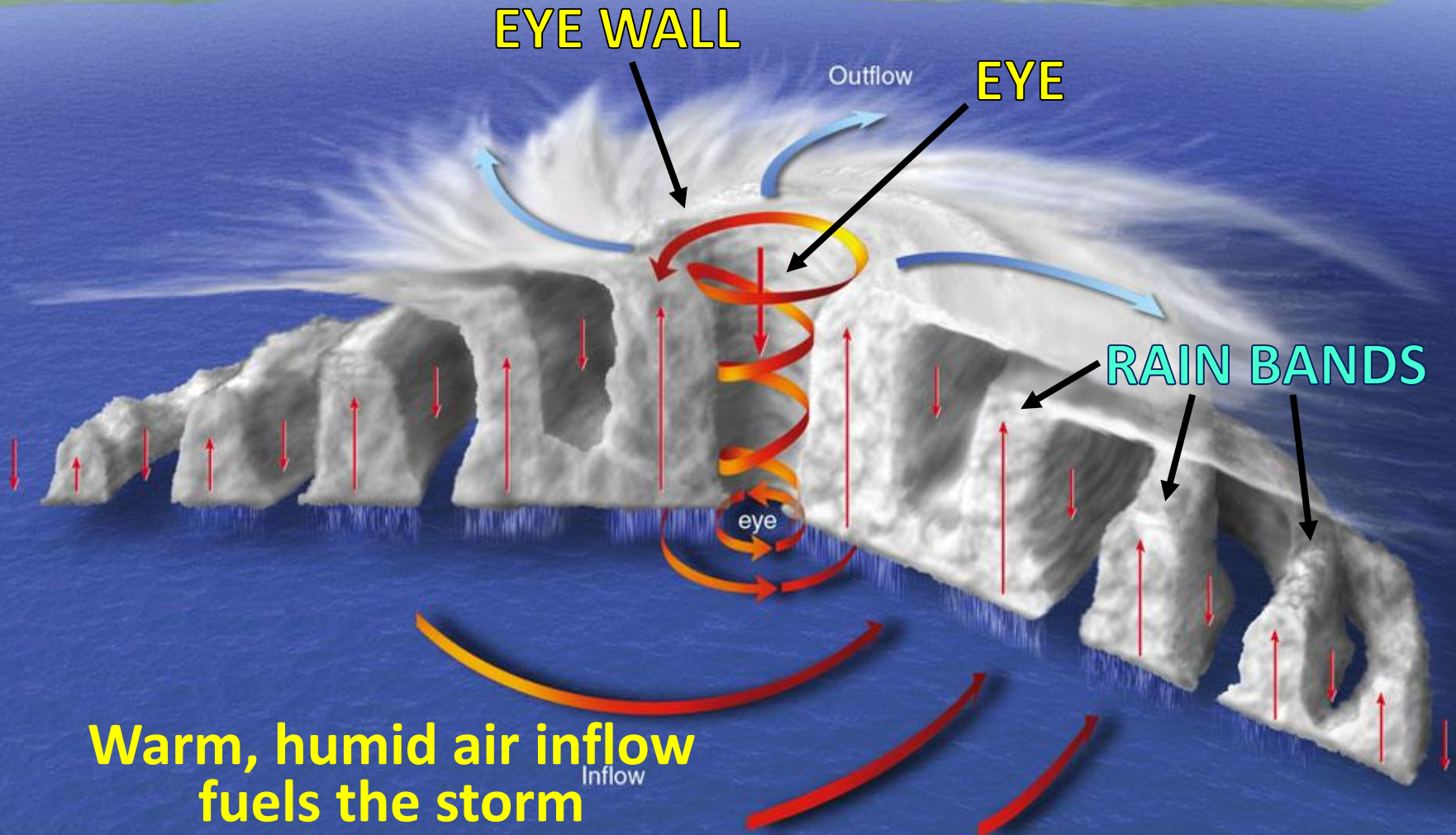
When is Hurricane Season?

- Northern Atlantic Ocean: a **distinct cyclone season** occurs from **June 1 to November 30** (peaking from late August through September).

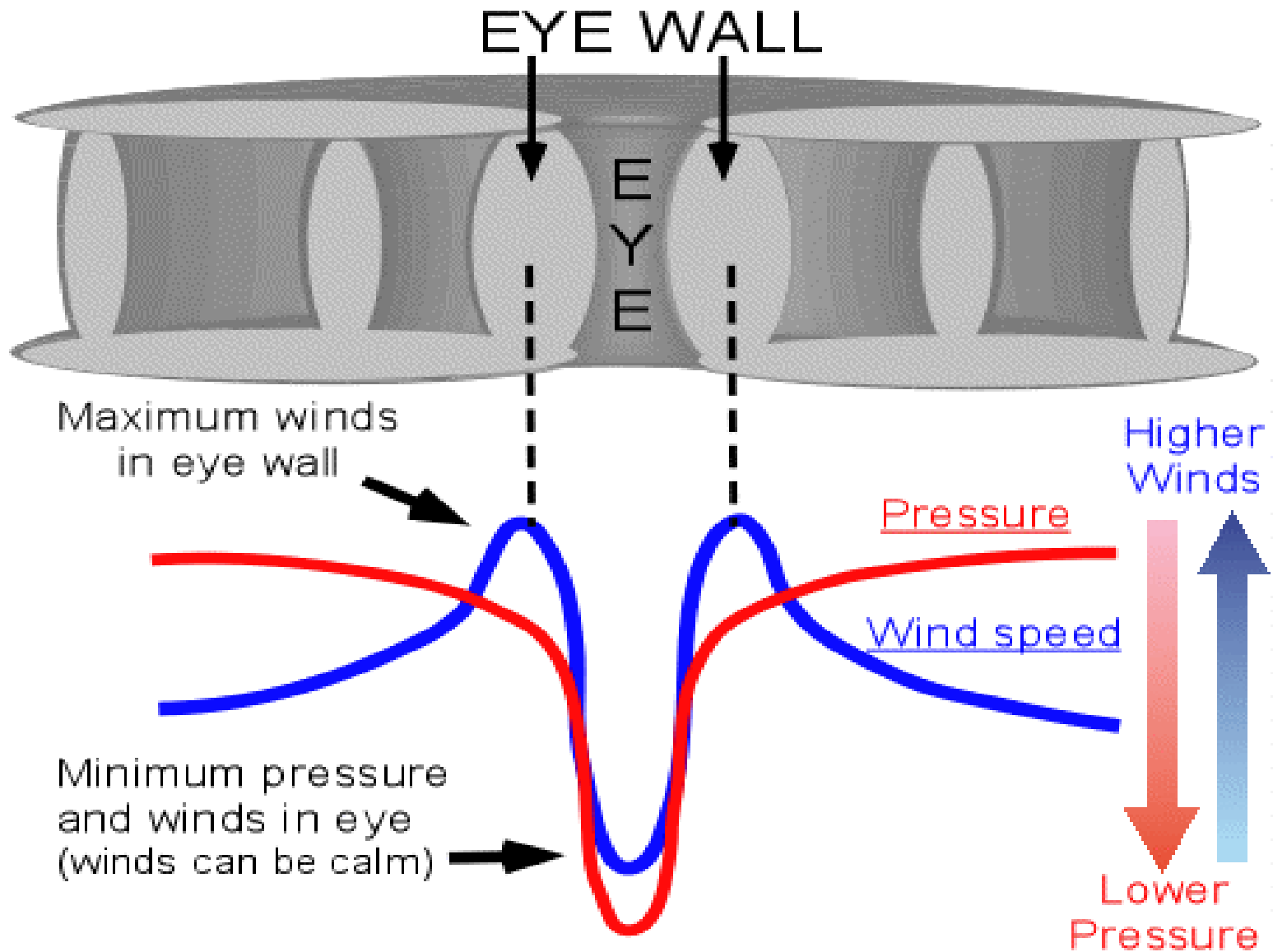


- Northeast Pacific Ocean: May 15 to November 30.
- Northwest Pacific: **year-round** (a minimum in February and March and a peak in early September).
- North Indian basin: April to December (has two peaks - May and November).
- Southern Hemisphere: **year-round** (peaking mid-February to early March).

Hurricane Structure

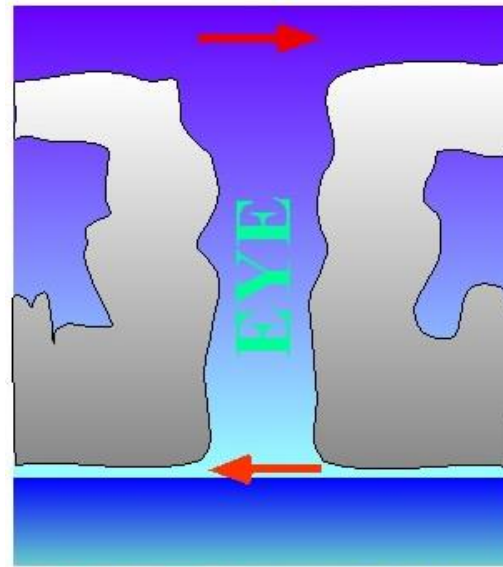


Pressure and Wind Speed Profile

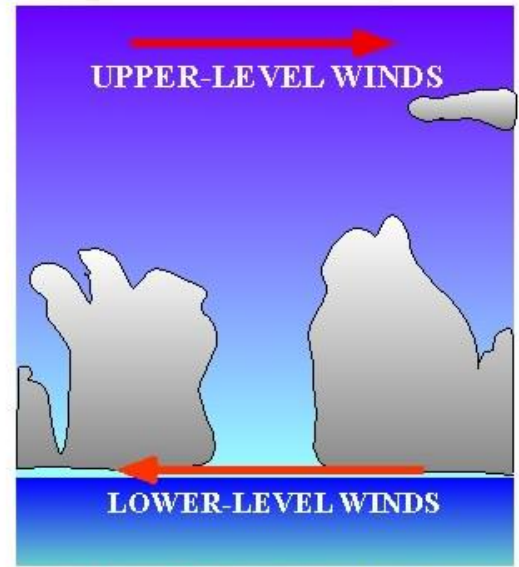


What destroys a hurricane?

- **Strong vertical wind shear** causes convection and loss of vertical storm organization.
- **Cold water** (moving over waters significantly below 26.5 °C/79.7 °F).



WEAK SHEAR = FAVORABLE



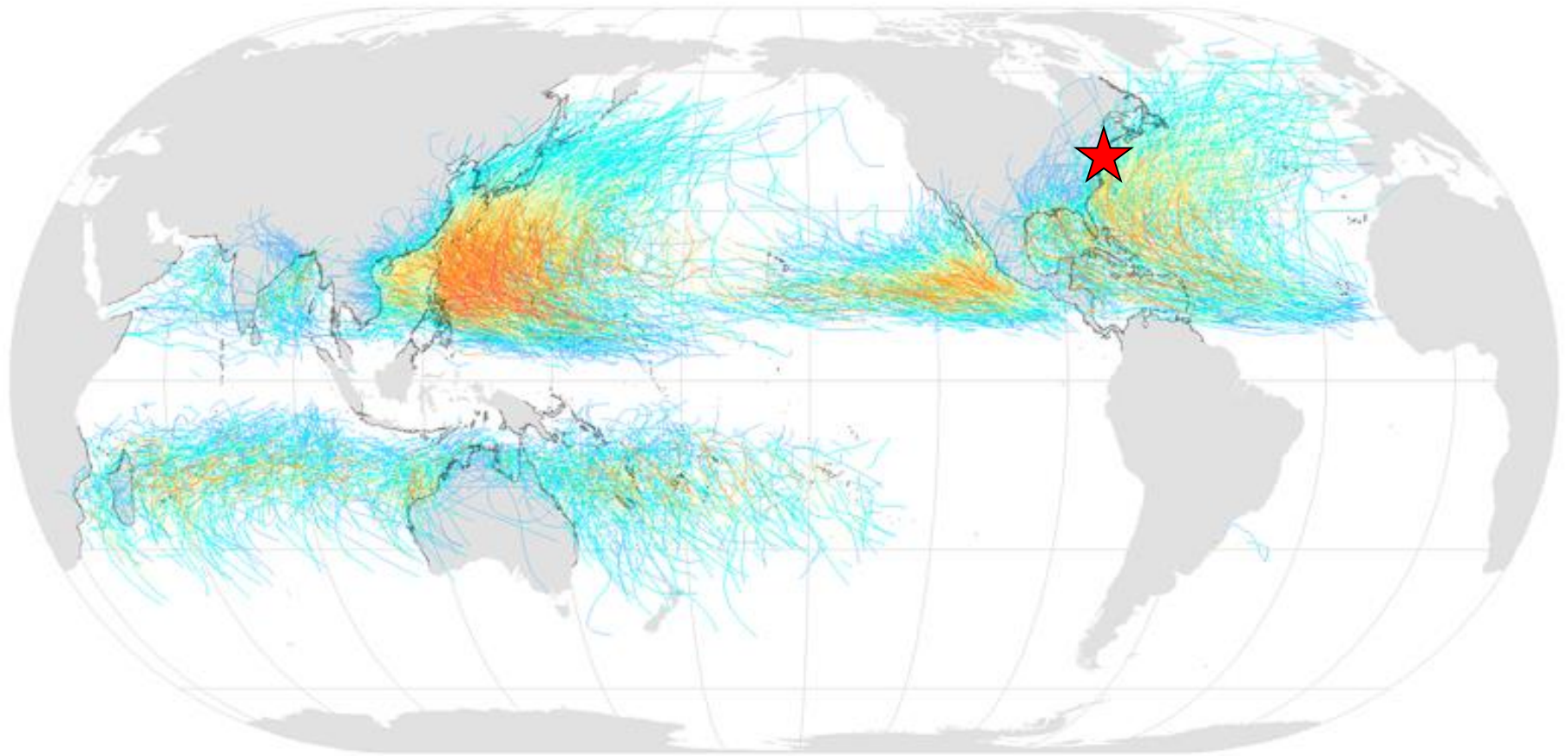
STRONG SHEAR = UNFAVORABLE



- **Movement over land** - most strong storms lose their strength very rapidly after **landfall** and become disorganized areas of low pressure within a day or two as a result of **friction** and **lack of moisture**.

Historical Data

Tropical Cyclones, 1945–2006



Saffir-Simpson Hurricane Scale:

tropical
depression

tropical
storm

hurricane
category 1

hurricane
category 2

hurricane
category 3

hurricane
category 4

hurricane
category 5

Measuring Hurricane Strength

Saffir-Simpson Hurricane Scale

Category	Wind speed (mph)	Storm surge (feet)
5	156+	More than 18
4	131–155	13–18
3	111–130	9–12
2	96–110	6–8
1	74–95	4–5
Additional classifications		
Tropical storm	39–73	0–3
Tropical depression	0–38	0