

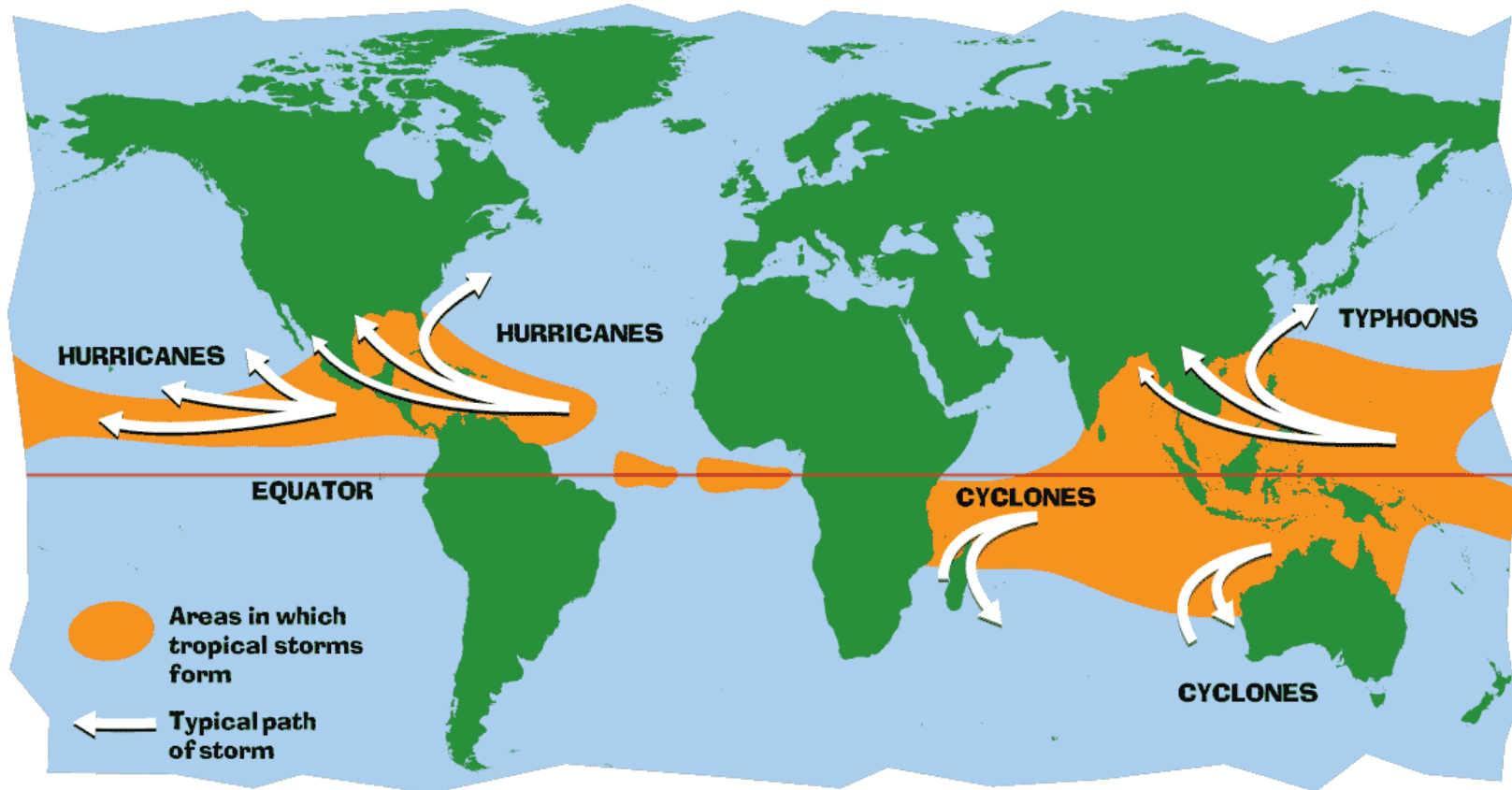
HURRICANES

An aerial satellite-style photograph of Hurricane Hugo. The hurricane is a large, circular storm system with a distinct eye in the center, surrounded by a dense ring of white clouds. The storm is moving over the dark blue Atlantic Ocean. In the lower-left corner, the green and brown outlines of the Florida peninsula are visible. The word "HURRICANES" is written in large, yellow, serif capital letters across the top of the image.

Hurricane Hugo

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

Formation and Typical Paths



- The majority of tropical cyclones forms 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.

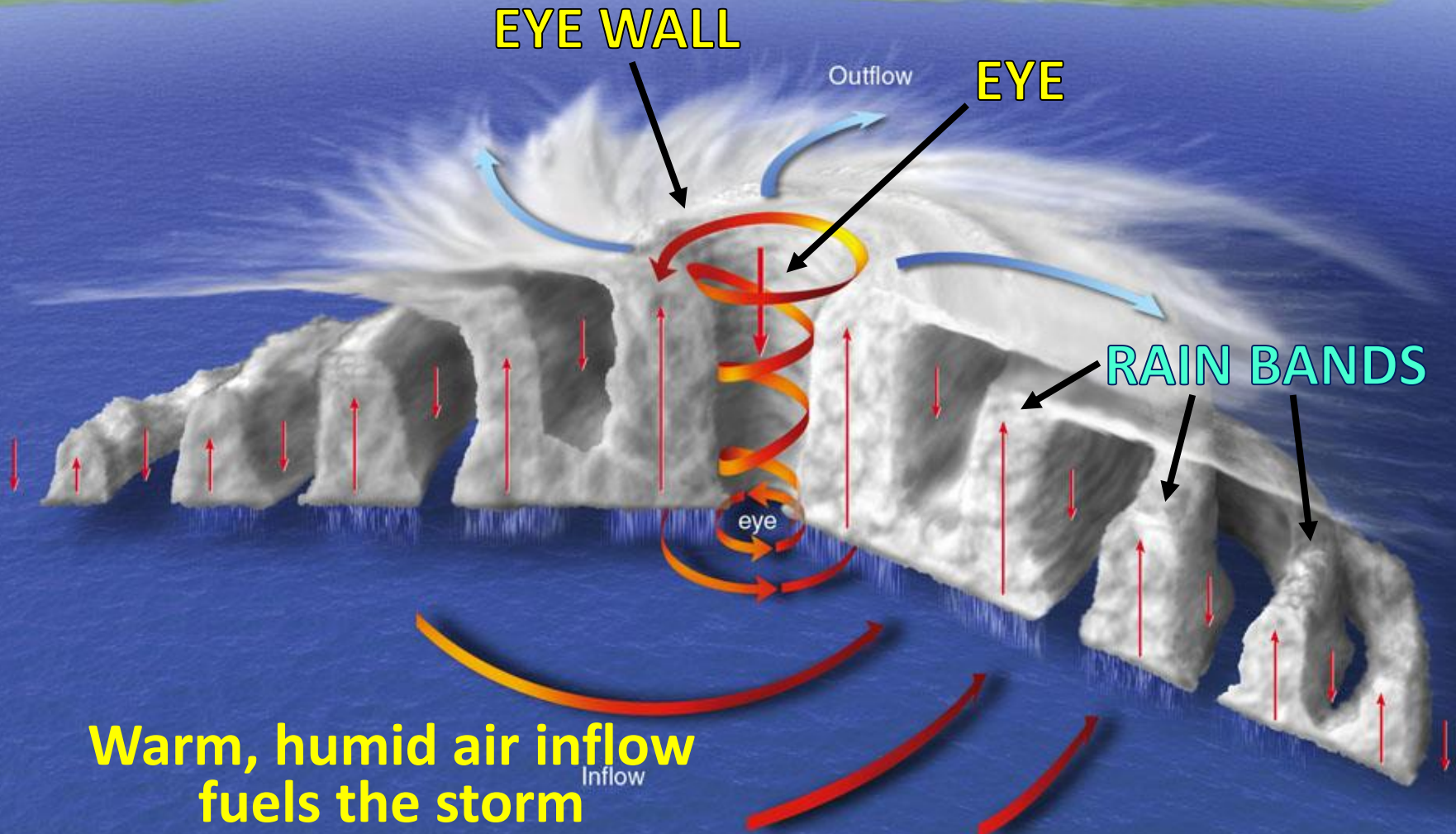
When is Hurricane Season?

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

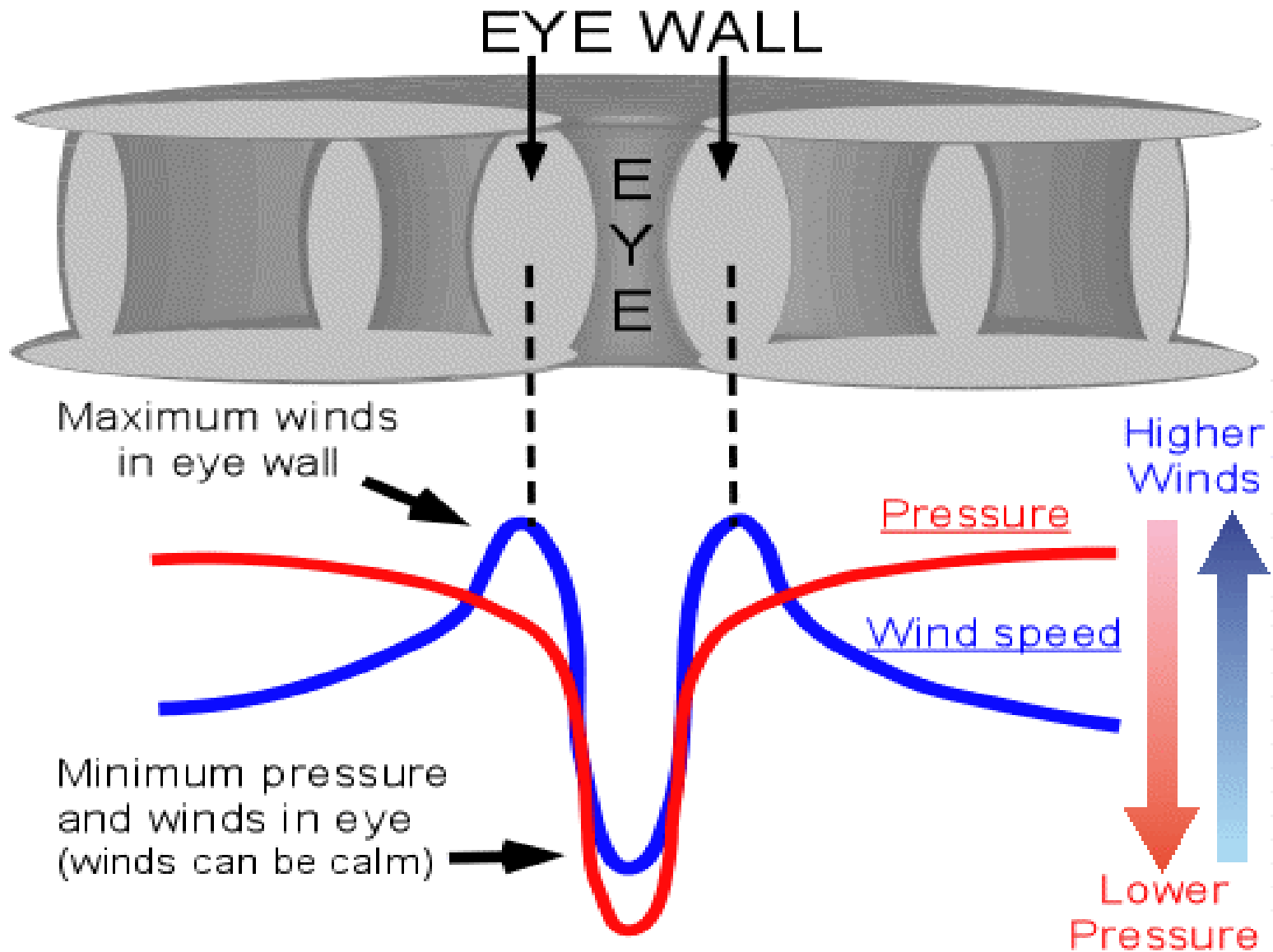


- Northeast Pacific Ocean: May 15 to November 30.
- Northwest Pacific: **year-round** (a minimum in February and March and a peak in early September).
- North Indian basin: April to December (has two peaks - May and November).
- Southern Hemisphere: **year-round** (peaking mid-February to early March).

Hurricane Structure

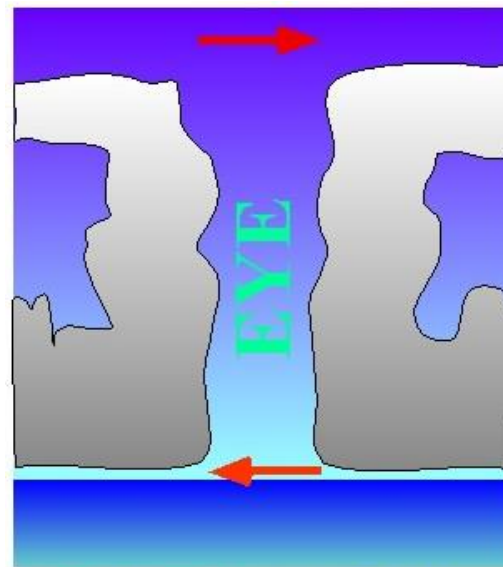


Pressure and Wind Speed Profile

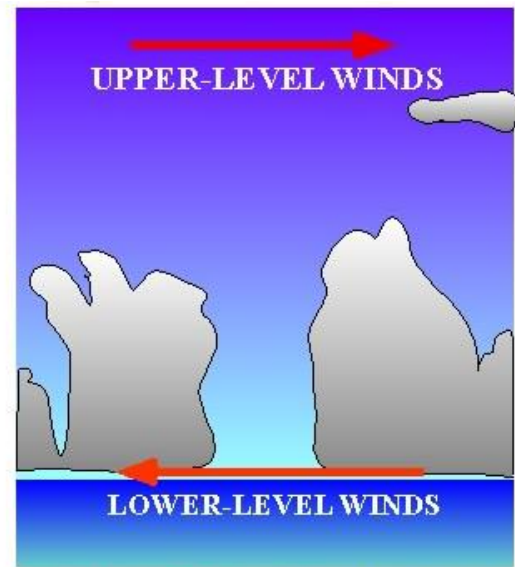


What destroys a hurricane?

- **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



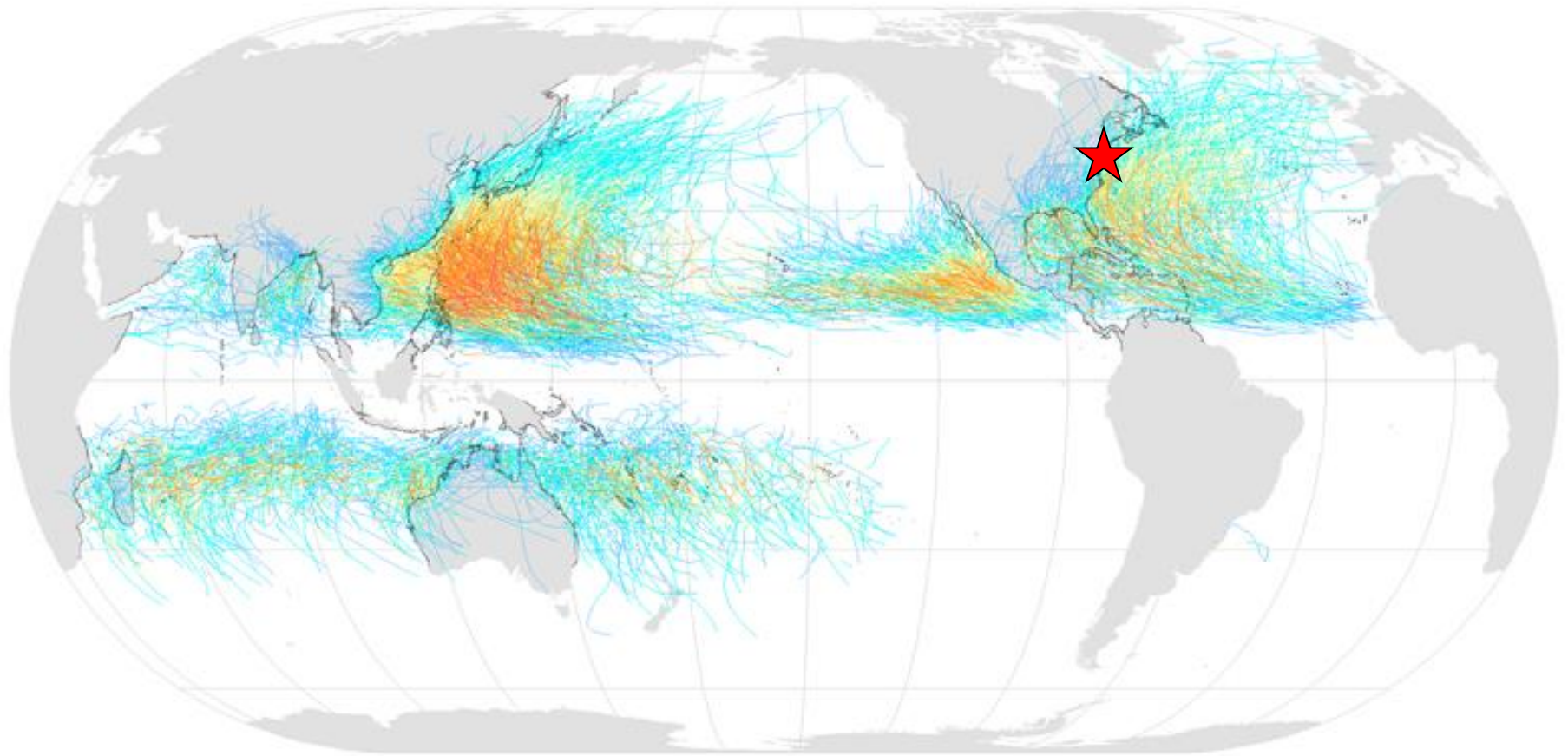
STRONG SHEAR = UNFAVORABLE



- **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

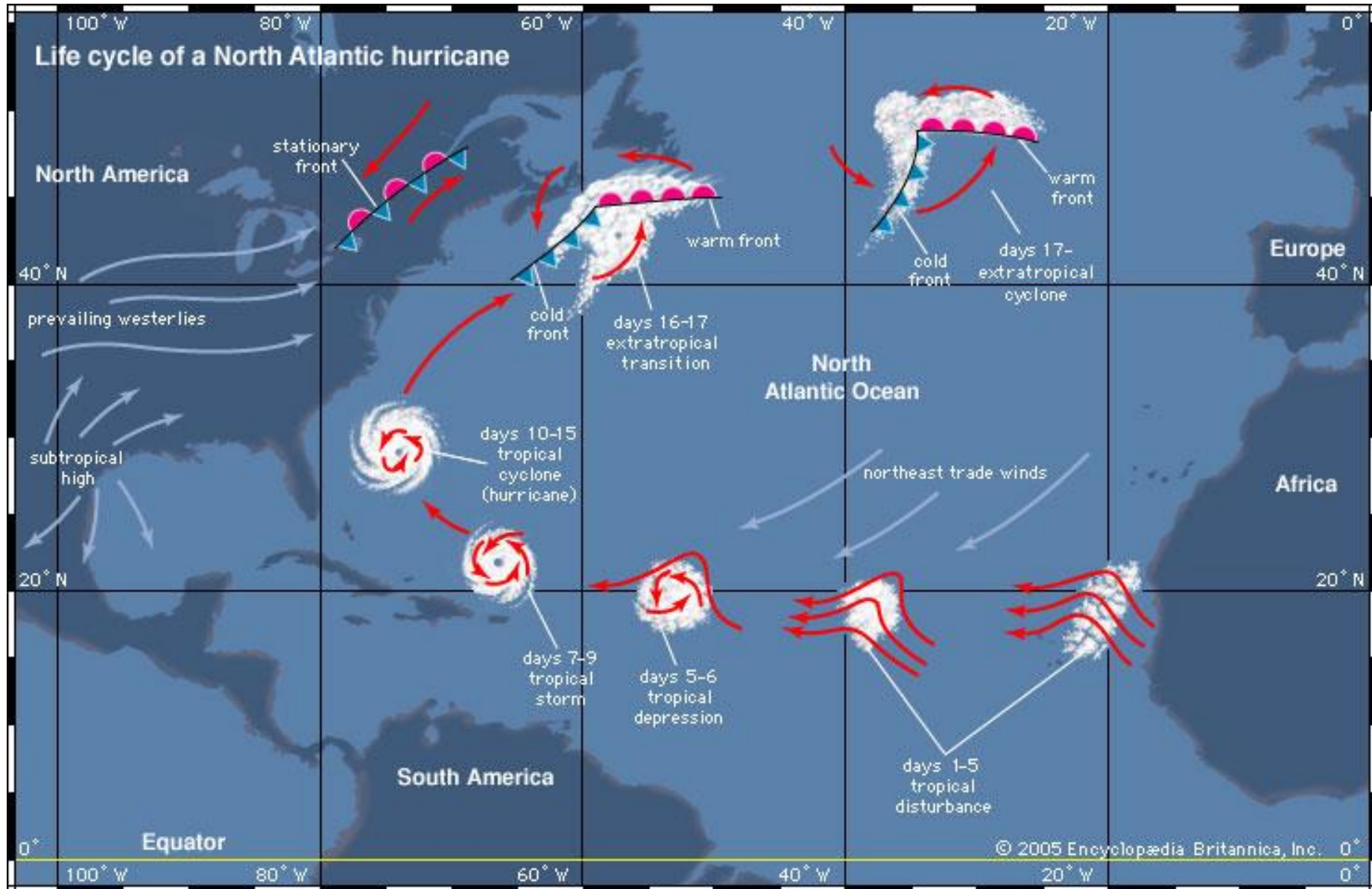
hurricane
category 2

hurricane
category 3

hurricane
category 4

hurricane
category 5

North Atlantic Hurricane Lifecycle

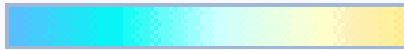


SANDY 2012

VS

IRENE 2011

WIND: 155kph



SIZE: approx 1,500km wide

Extremely large

Post-Tropical Cyclone at landfall

Storm Surge up to 4 m



WIND: 140kph



Category 1 Hurricane at landfall

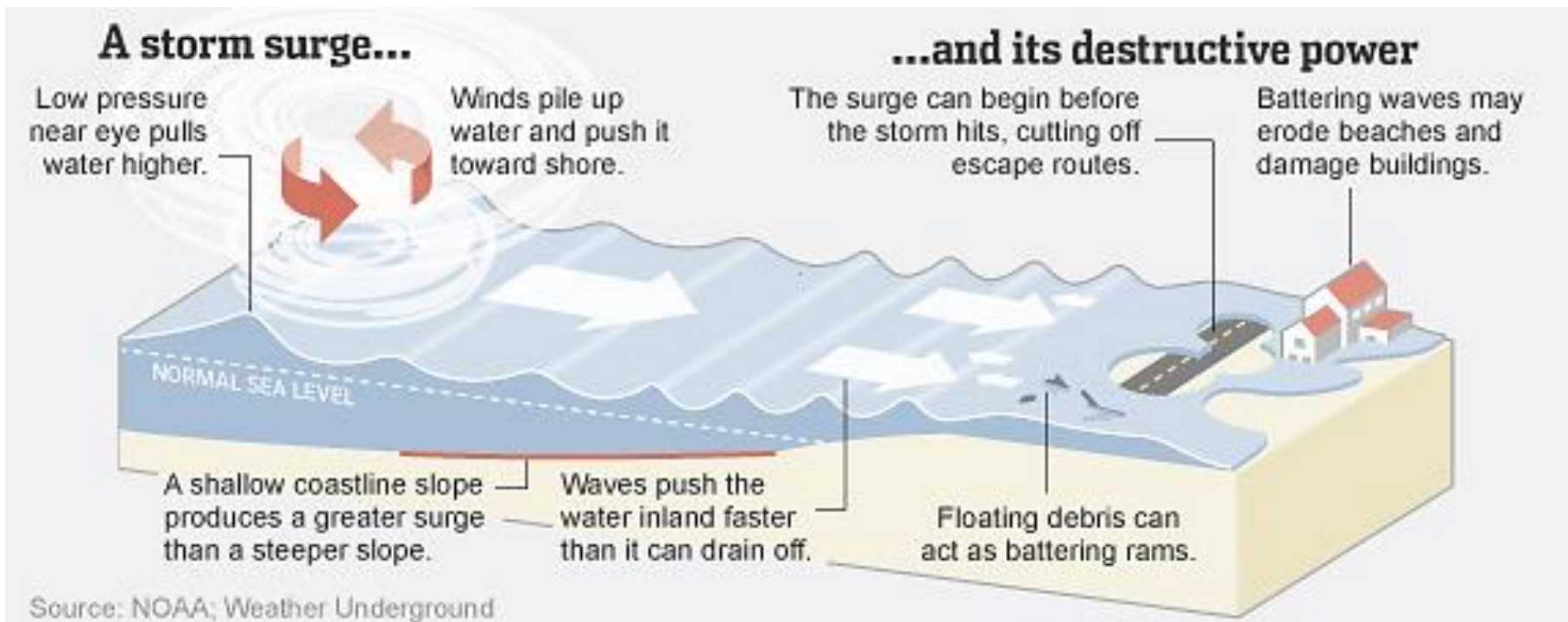
SIZE: 965km wide (max)

Storm Surge up to 1.5 m



What is Storm Surge?

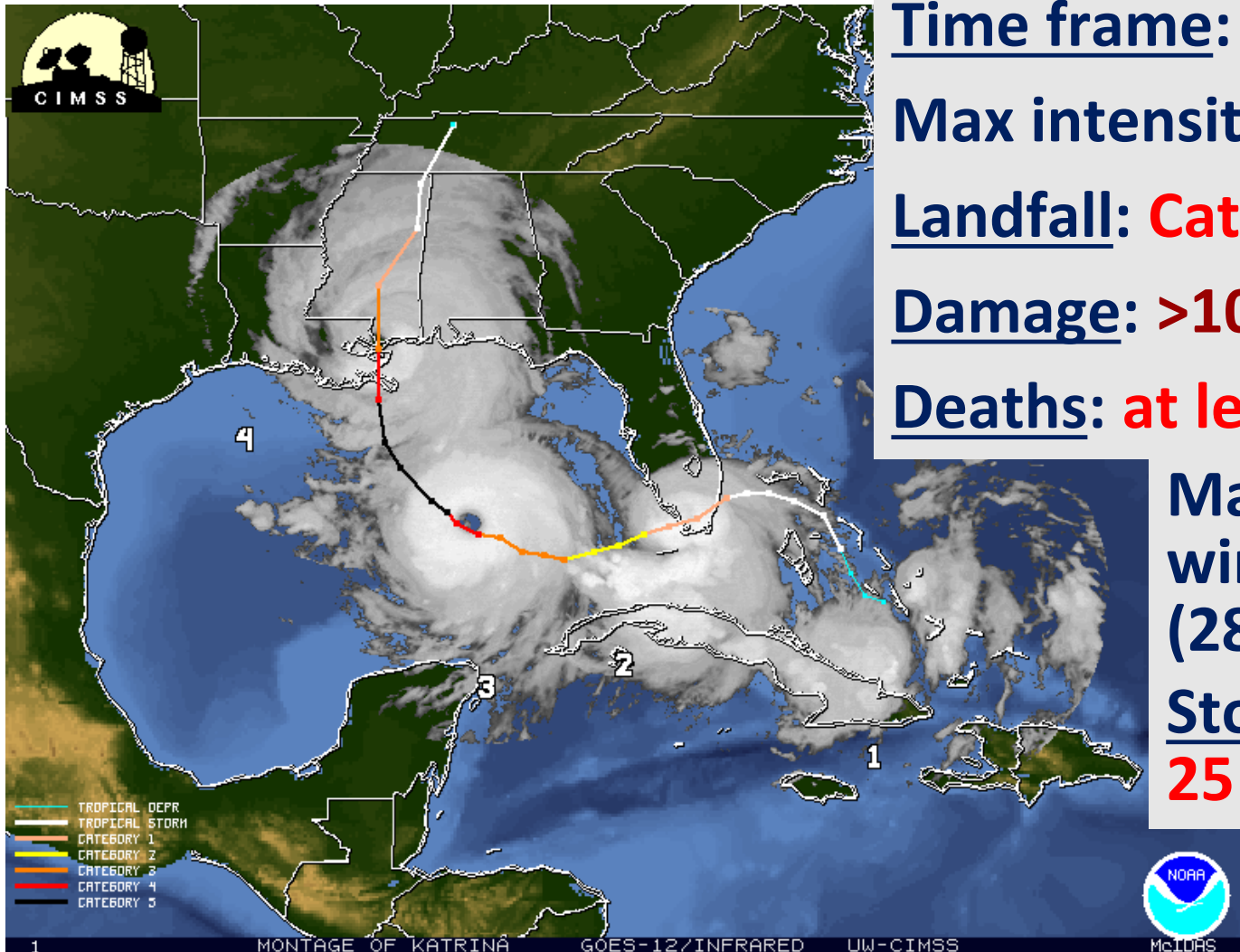
Storm surge is an abnormal rise of water generated by a storm, **over and above** the predicted **astronomical tides**.



Important factors: storm **intensity** (wind speed) and size, **forward speed**, **angle of approach** to the coast, central pressure (minimal contribution in comparison to the wind), the **coastline shape and bathymetry**.

Hurricane Katrina, 2005

the **costliest** hurricane ever recorded in the Atlantic



Time frame: **August 23-31**

Max intensity: **Category 5**

Landfall: **Category 3**

Damage: **>100 billion USD**

Deaths: **at least 1,833**

Max sustained winds: **175 mph (280 km/h)**

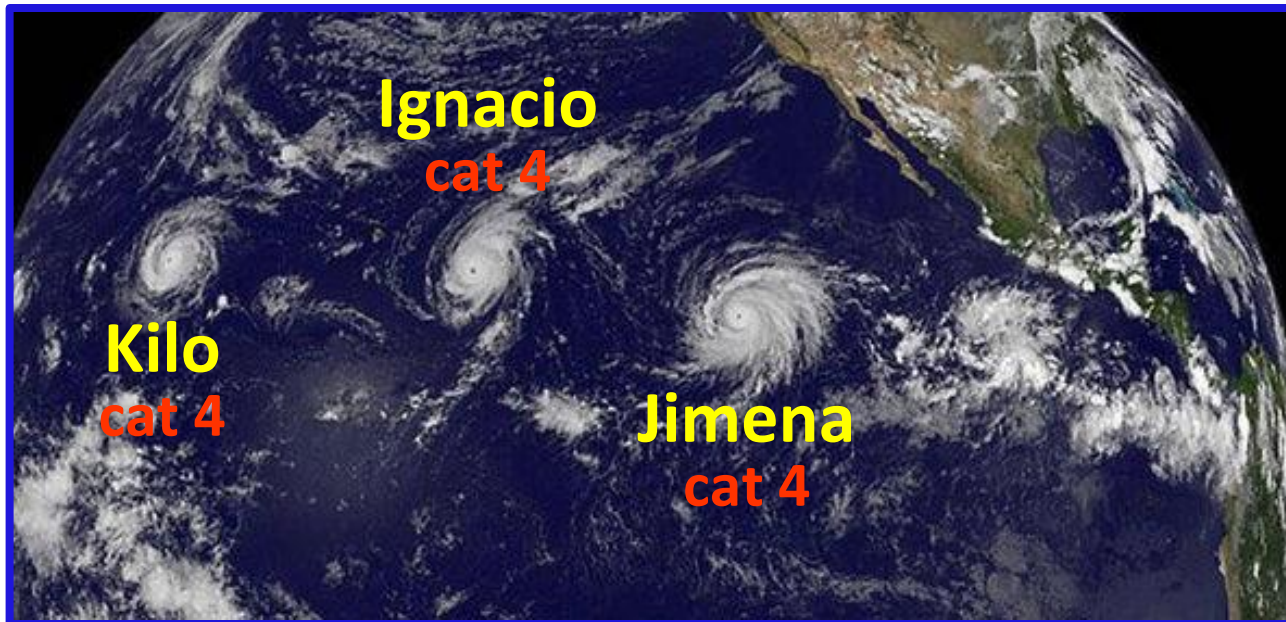
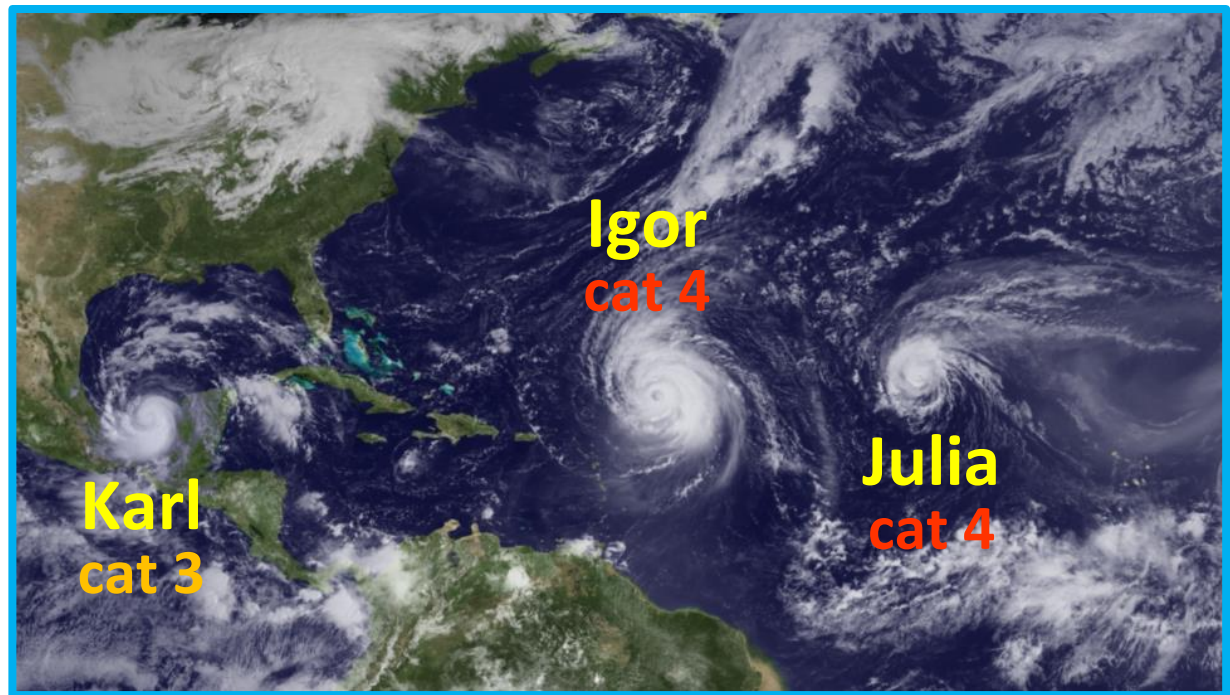
Storm surge: **25 to 28 feet**



McILRS

At Once...

North
Atlantic
Basin,
09/19/10



Pacific
Basin,
08/31/15