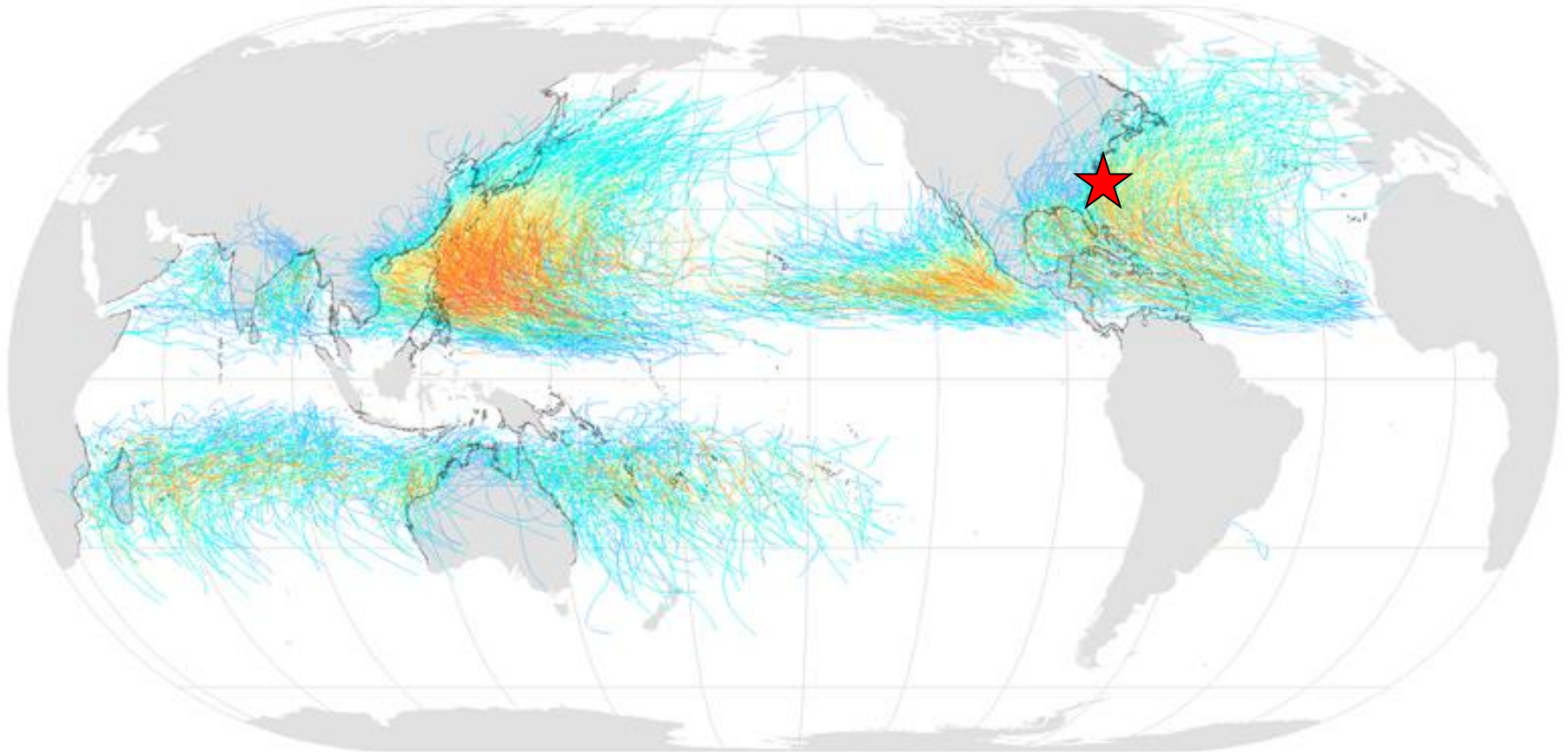
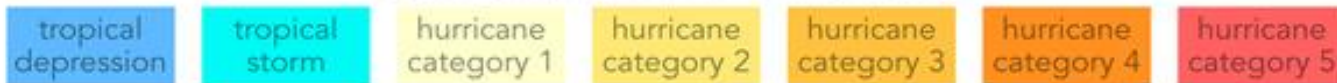


# Historical Data

## Tropical Cyclones, 1945–2006



Saffir-Simpson Hurricane Scale:



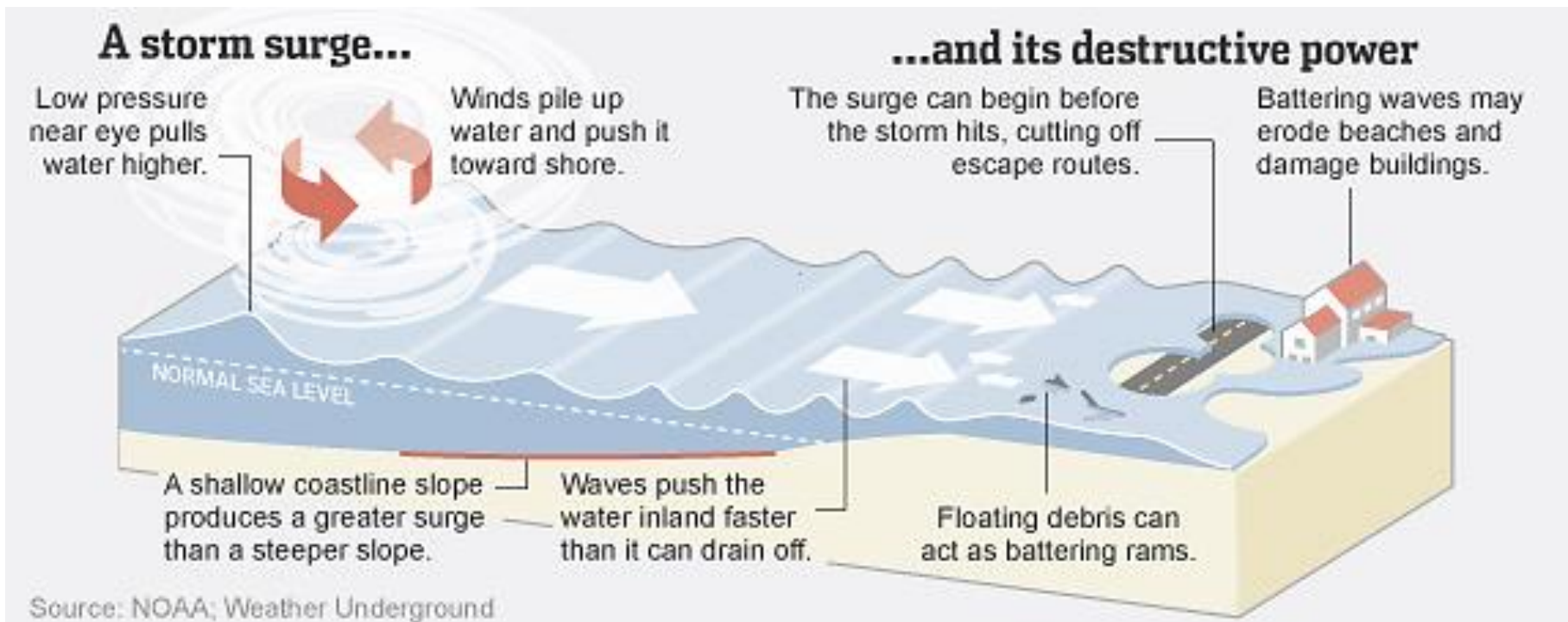
# Measuring Hurricane Strength

## Saffir-Simpson Hurricane Scale

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

# What is Storm Surge?

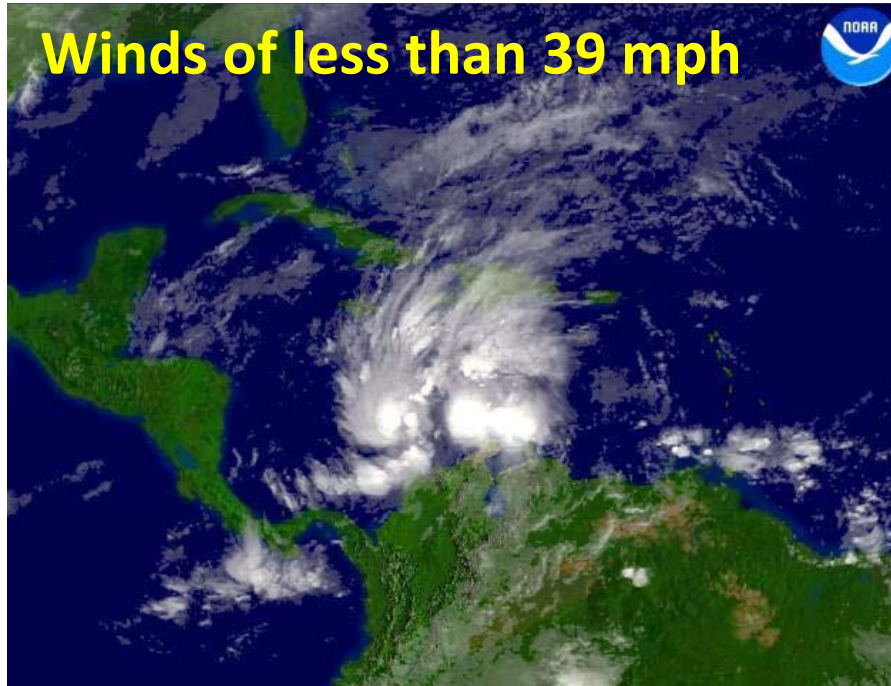
Storm surge is an abnormal rise of water generated by a storm, **over and above** the predicted **astronomical tides**.



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**.

# Stages of Hurricane Development

## 1. Tropical Depression (Wave)



**Lacks structure** – no well developed feeder bands or eye.

**Not given a name yet.**

## 2. Tropical Storm



**Feeder bands** are beginning to develop. Eye and eye wall still not well formed.

In the Atlantic, storms are **given a name** at that stage.



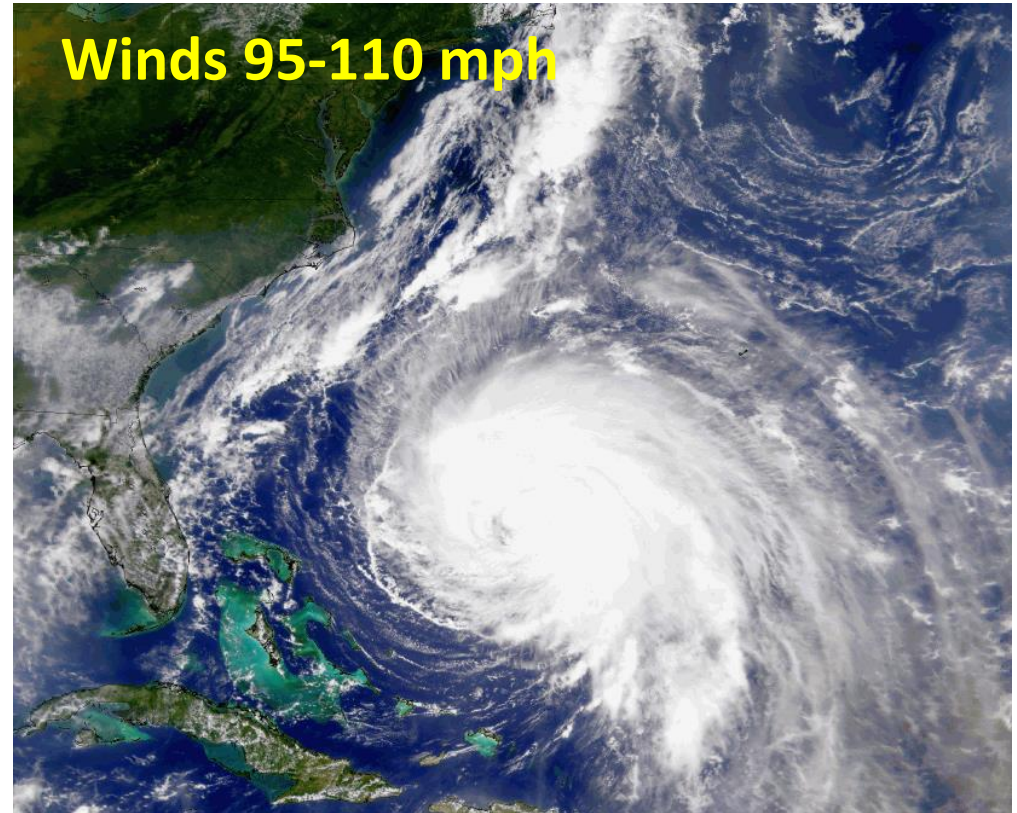
# Stages of Hurricane Development

## 3. Category 1 Hurricane



Well developed feeder bands. An **eye** begins to form.

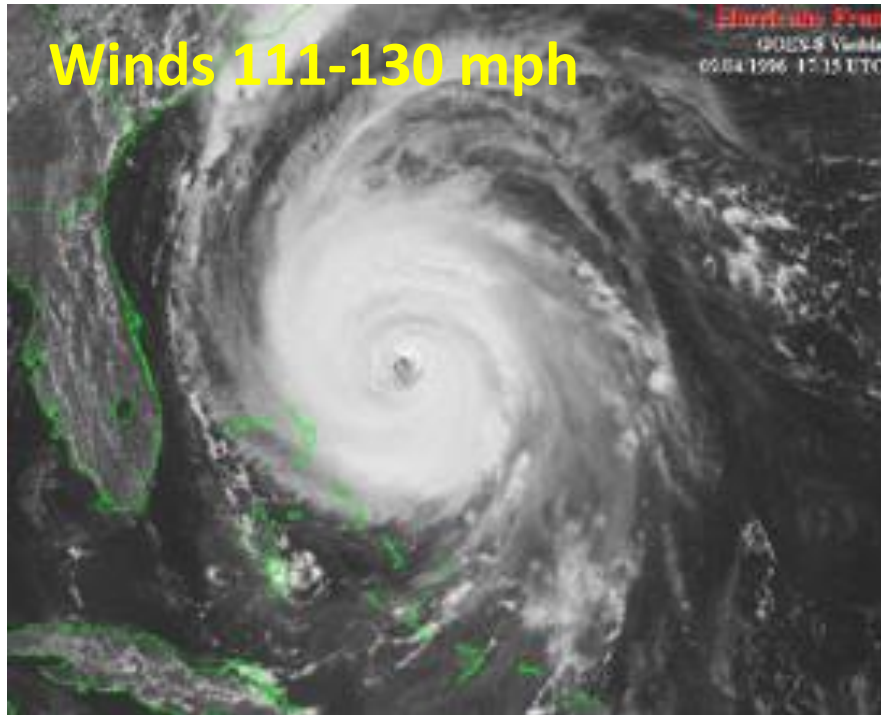
## 4. Category 2 Hurricane



An **eye and eye wall** are usually very well formed.  
Storm is tightening around center.

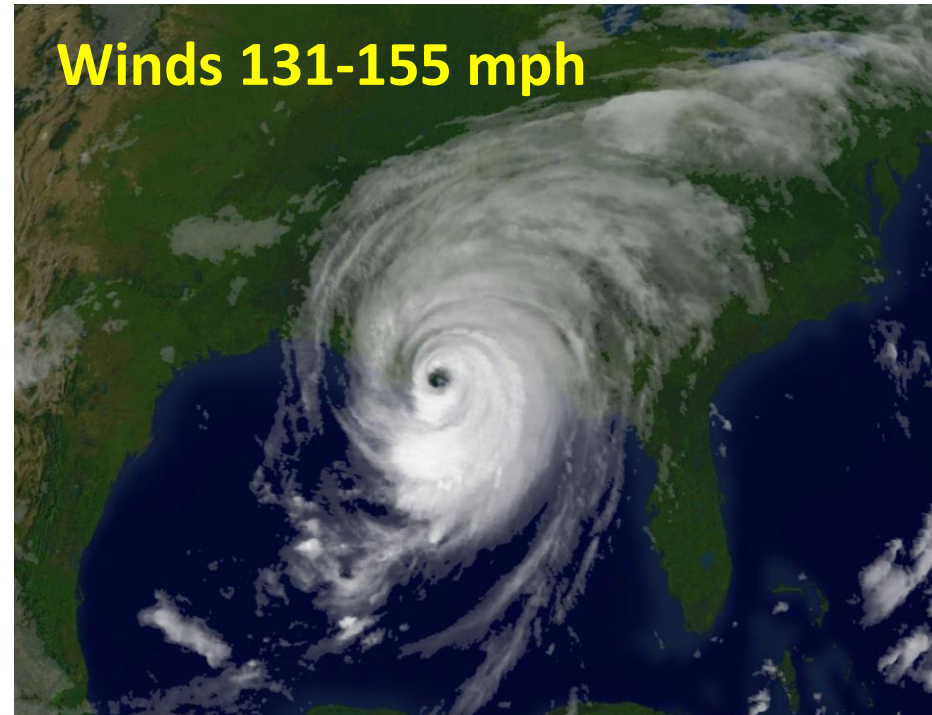
# Stages of Hurricane Development

## 5. Category 3 Hurricane



Now a **“Major Storm”**.  
**Intense flooding and building damage** will occur to most areas on the coast. Further inland, the damage will still be substantial.

## 6. Category 4 Hurricane

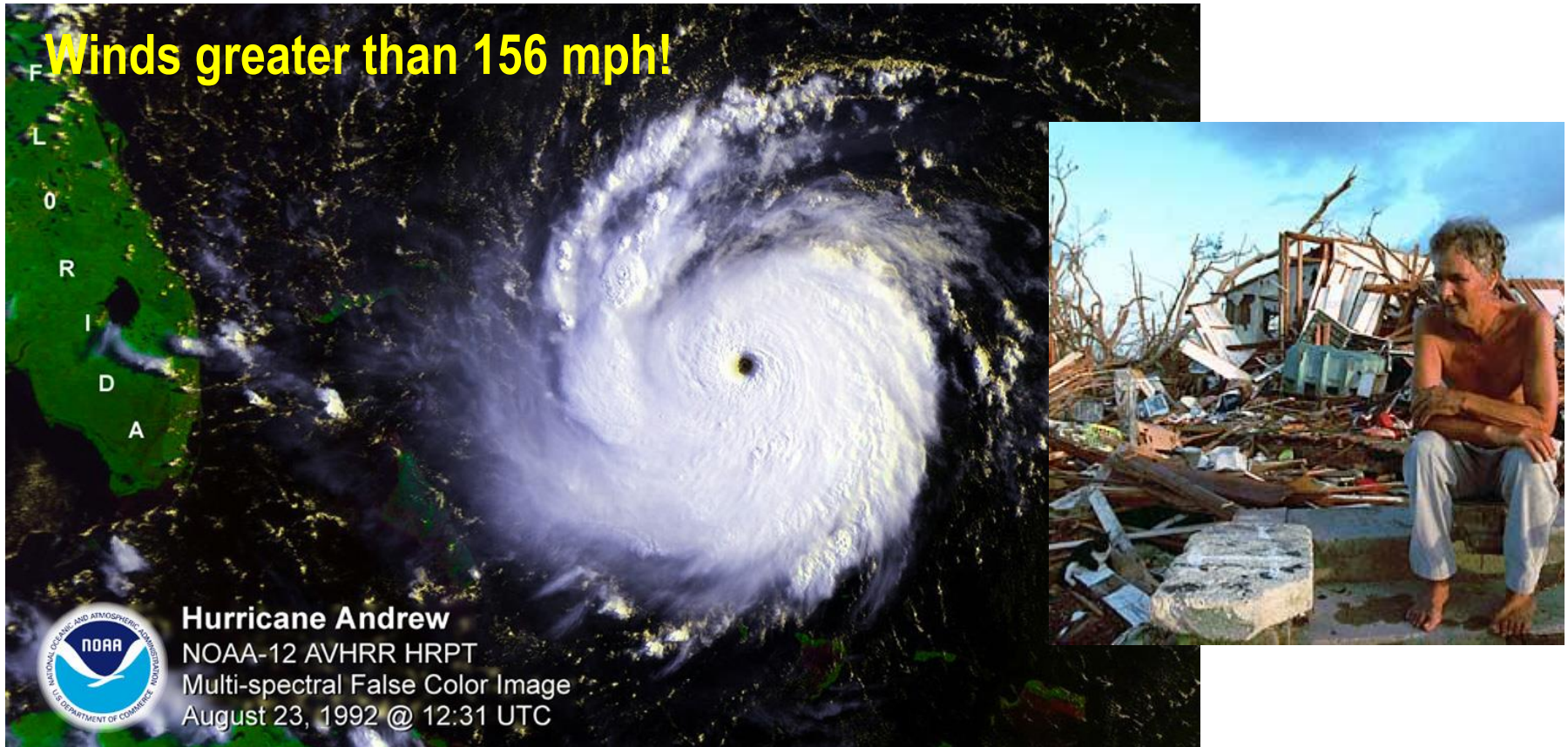


All shrubs, signs and trees blown down. **Extensive damage** to doors and windows.  
**Major damage** to lower floors of structures near the coast **due to storm surge**.



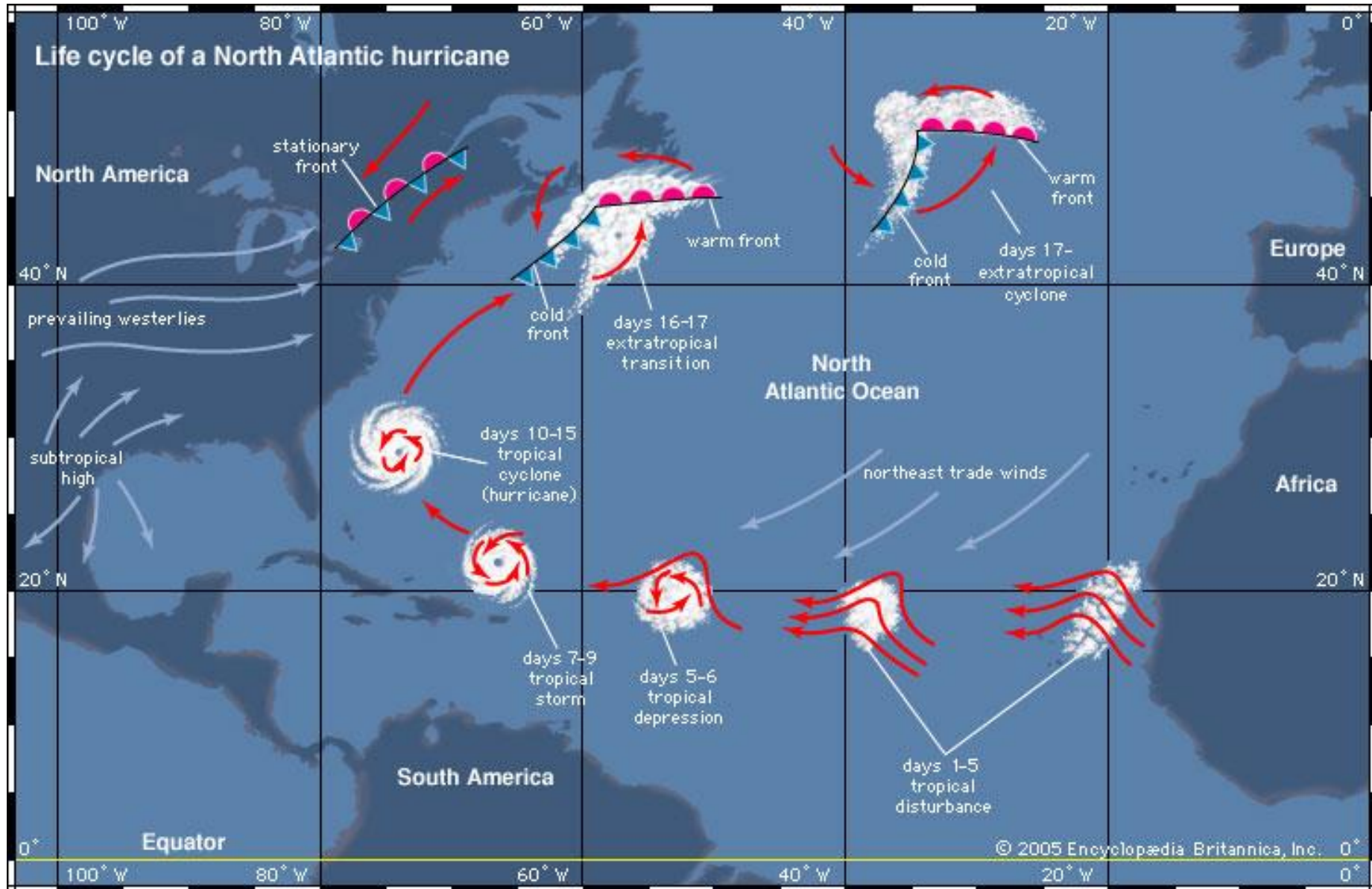
# Stages of Hurricane Development

## Stage 7 – Category 5 Hurricane



**Complete roof failure** on many residential and industrial buildings. Some **complete building failures**. **Massive evacuation** of residential areas on low ground (5-10 miles).

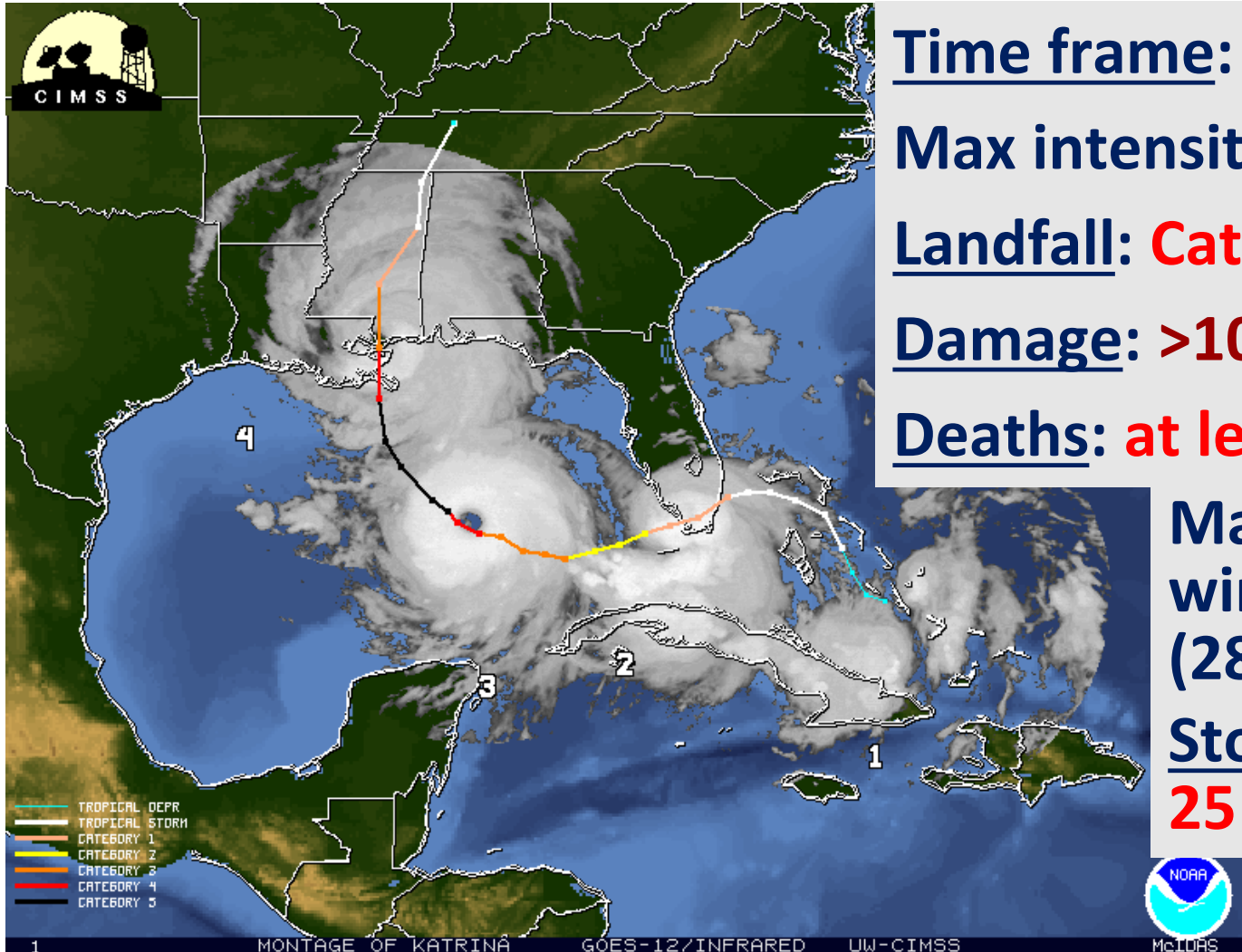
# North Atlantic Hurricane Lifecycle





# 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**

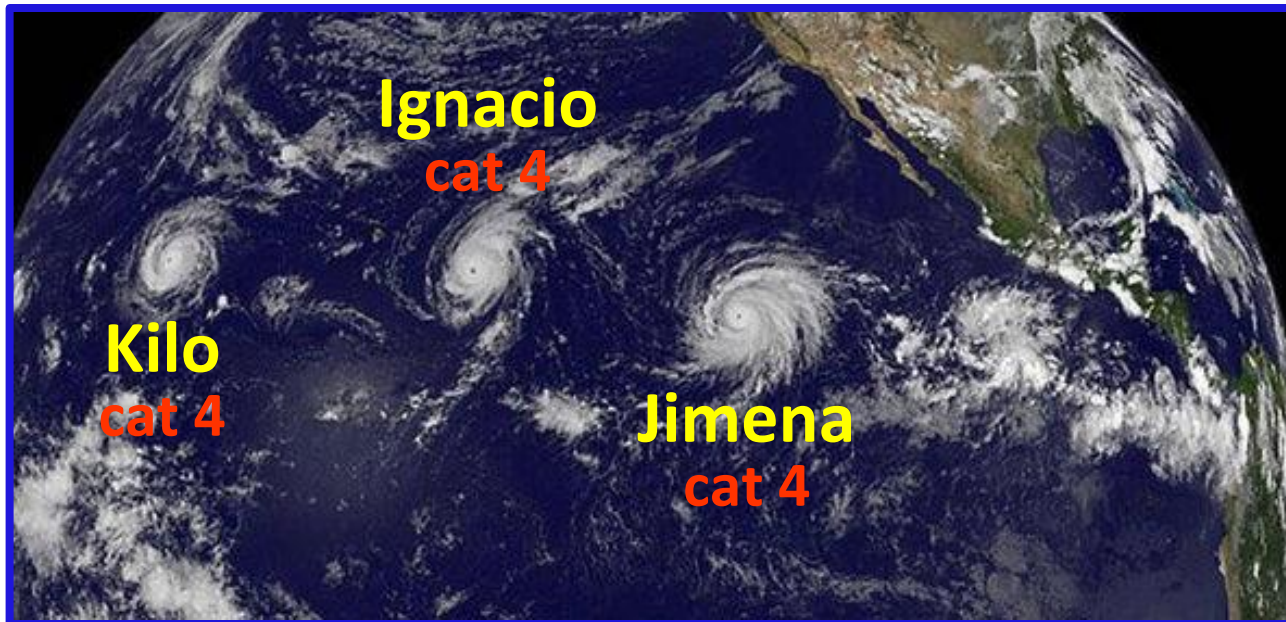
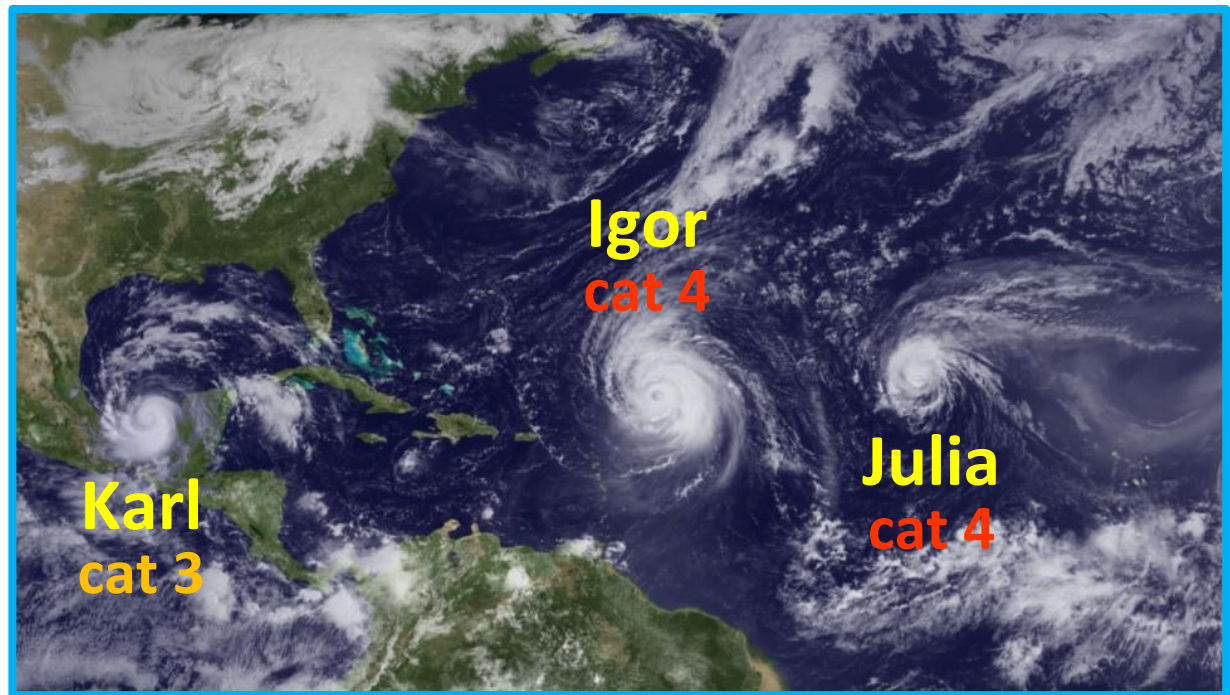
Deaths: **at least 1,833**

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

Storm surge: **25 to 28 feet**

# At Once...

North  
Atlantic  
Basin,  
09/19/10



Pacific  
Basin,  
08/31/15