

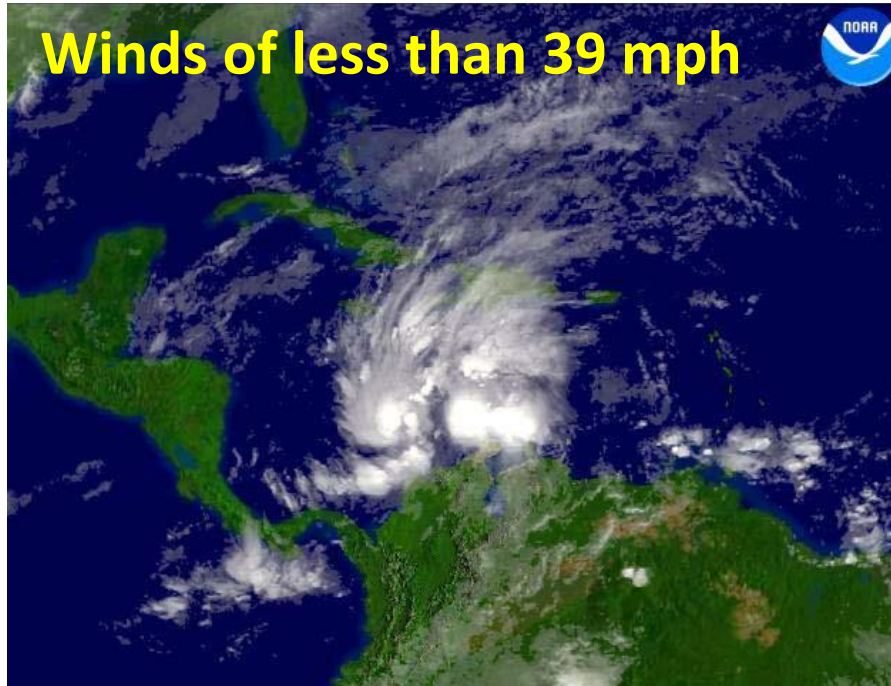
Measuring Hurricane Strength

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

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.

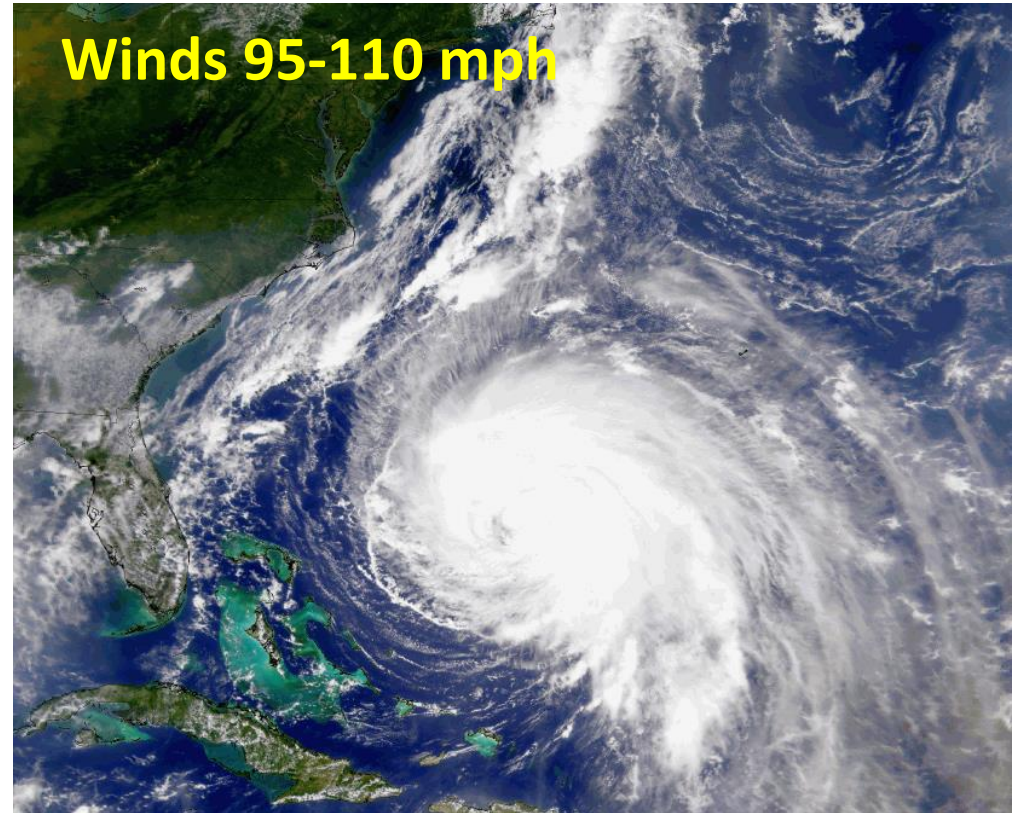
Stages of Hurricane Development

3. Category 1 Hurricane



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

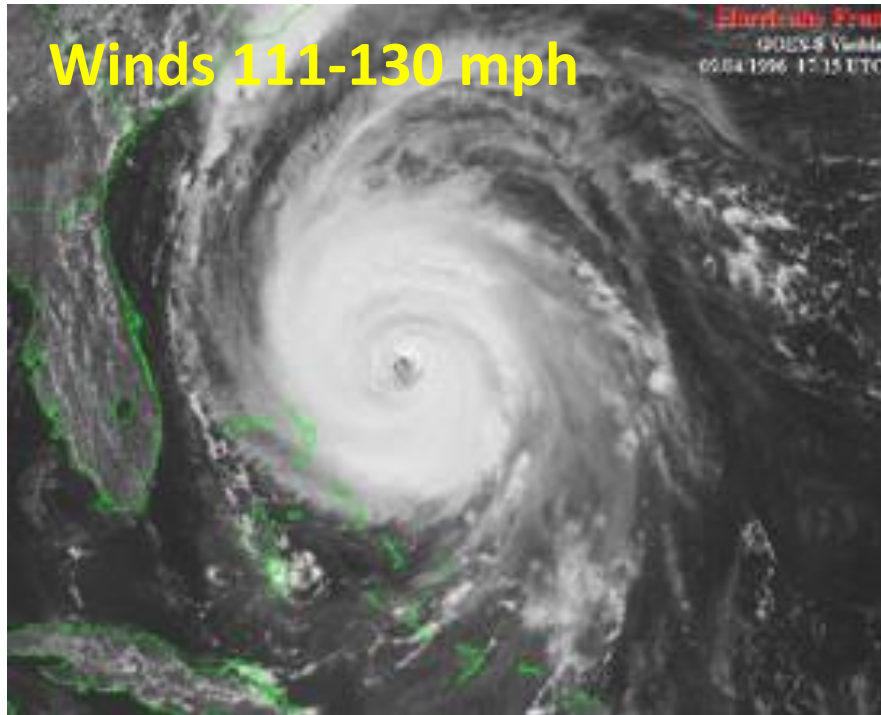
4. Category 2 Hurricane



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

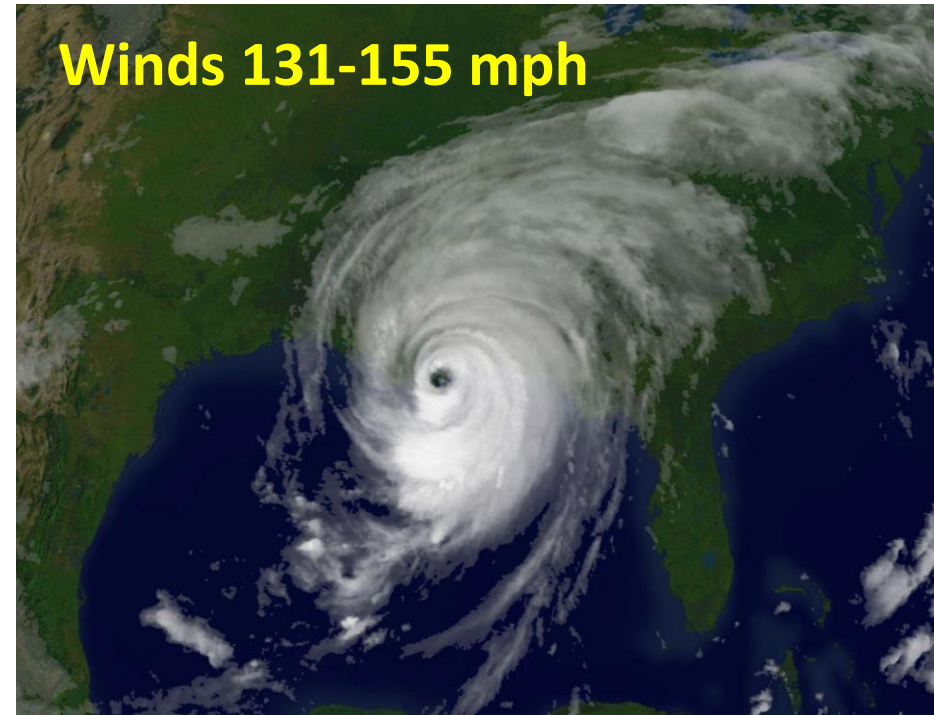
Stages of Hurricane Development

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.

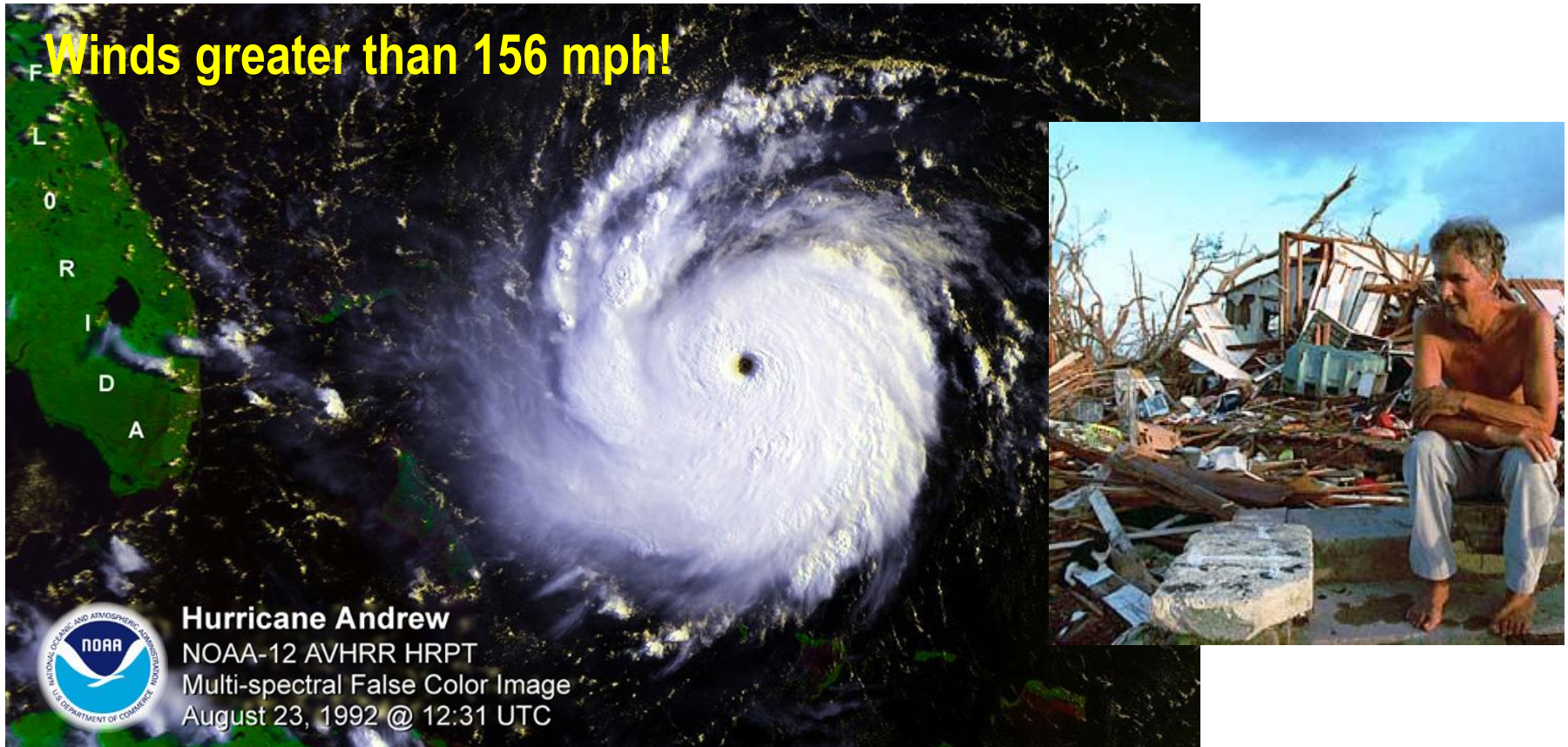
6. Category 4 Hurricane



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**.

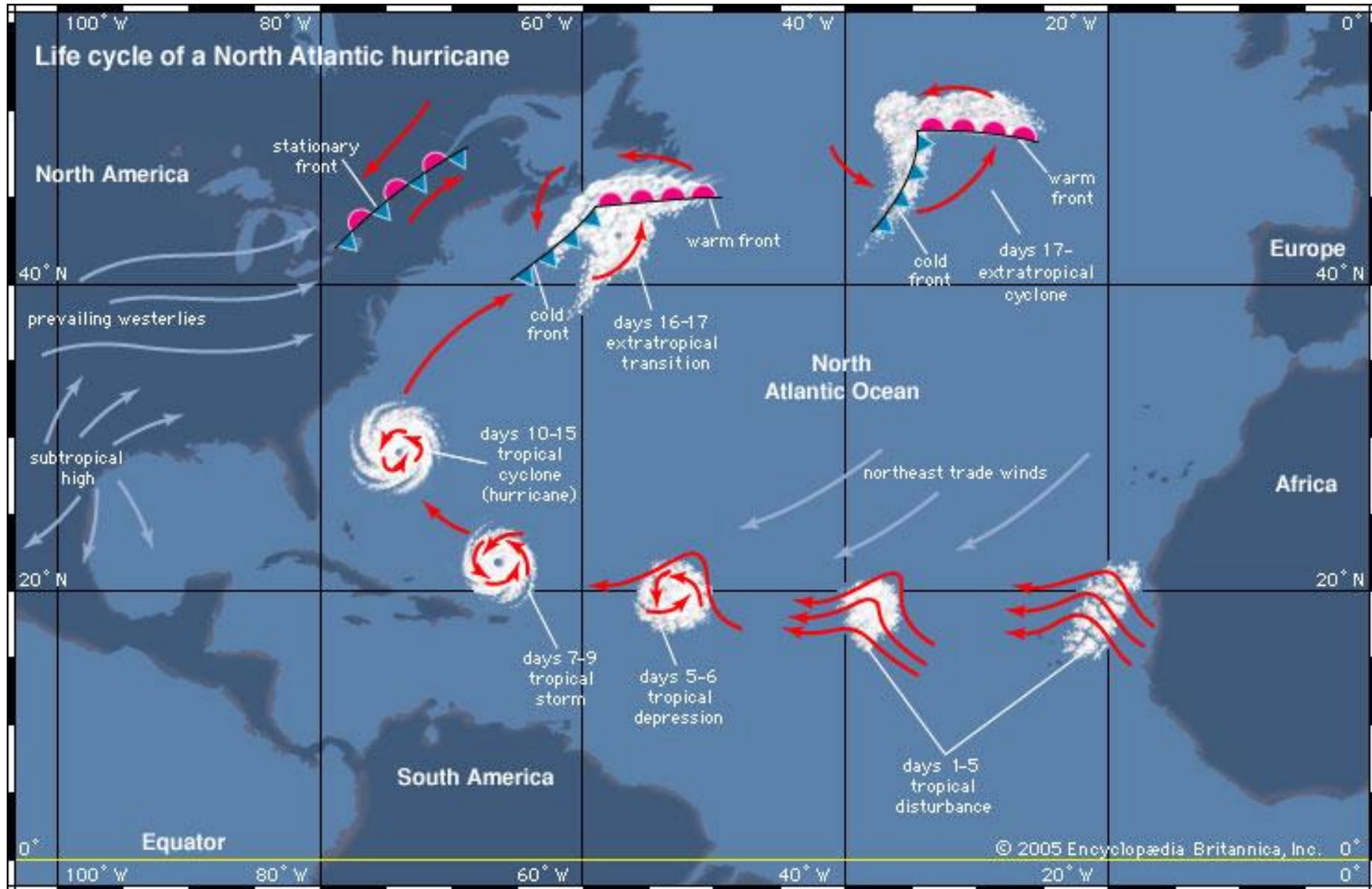
Stages of Hurricane Development

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



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

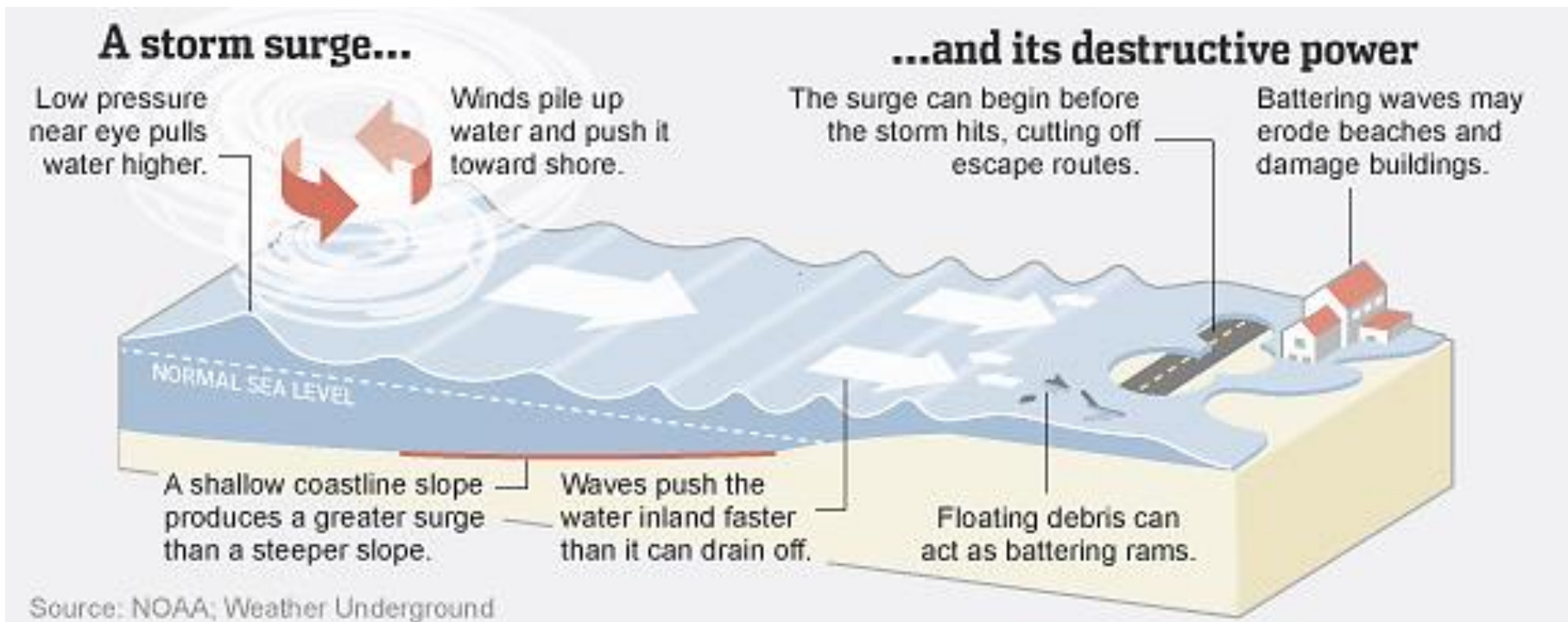
SIZE: 965km wide (max)

Storm Surge up to 1.5 m



What is Storm Surge?

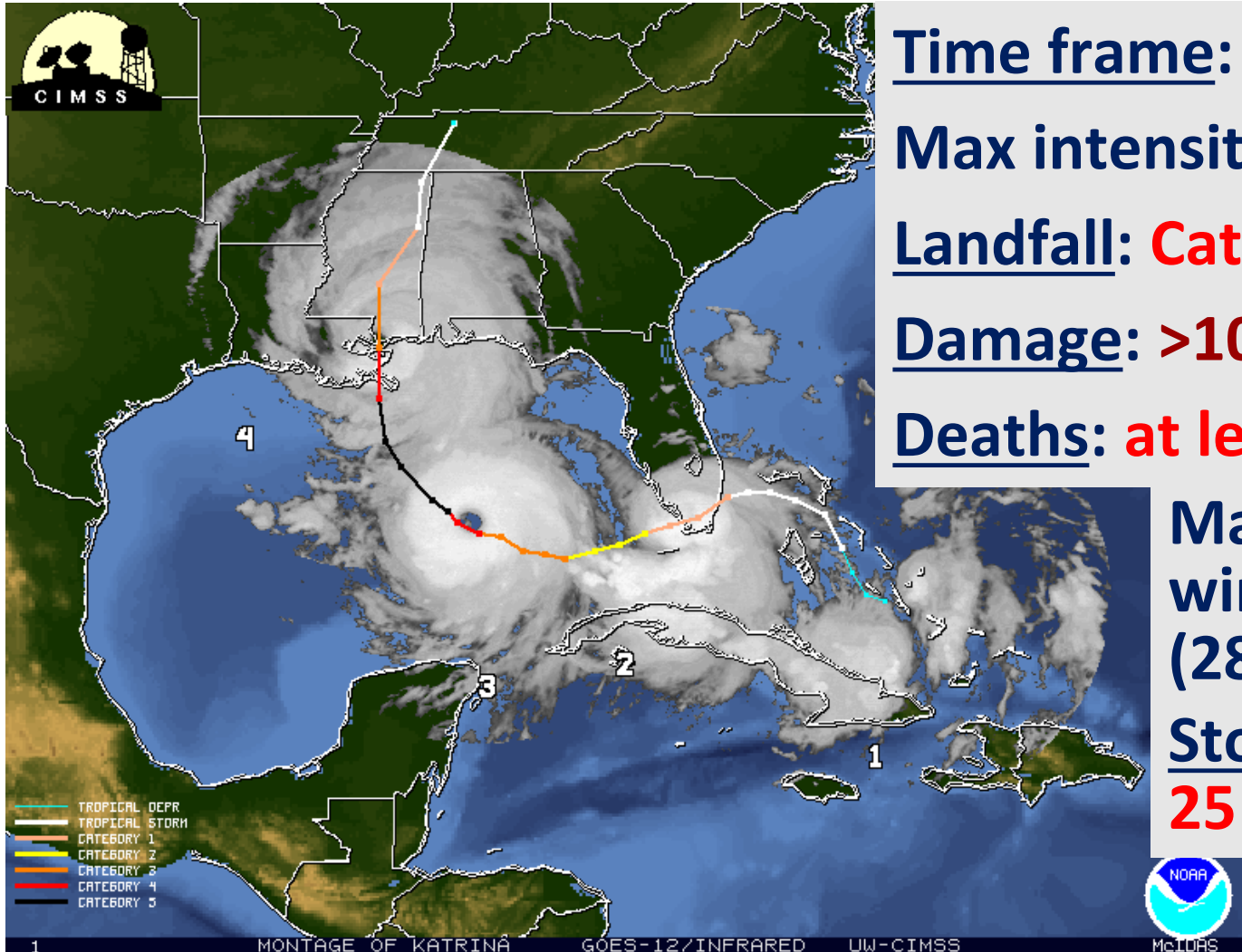
Storm surge is an abnormal rise of water generated by a storm, **over and above** the predicted **astronomical tides**.



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**

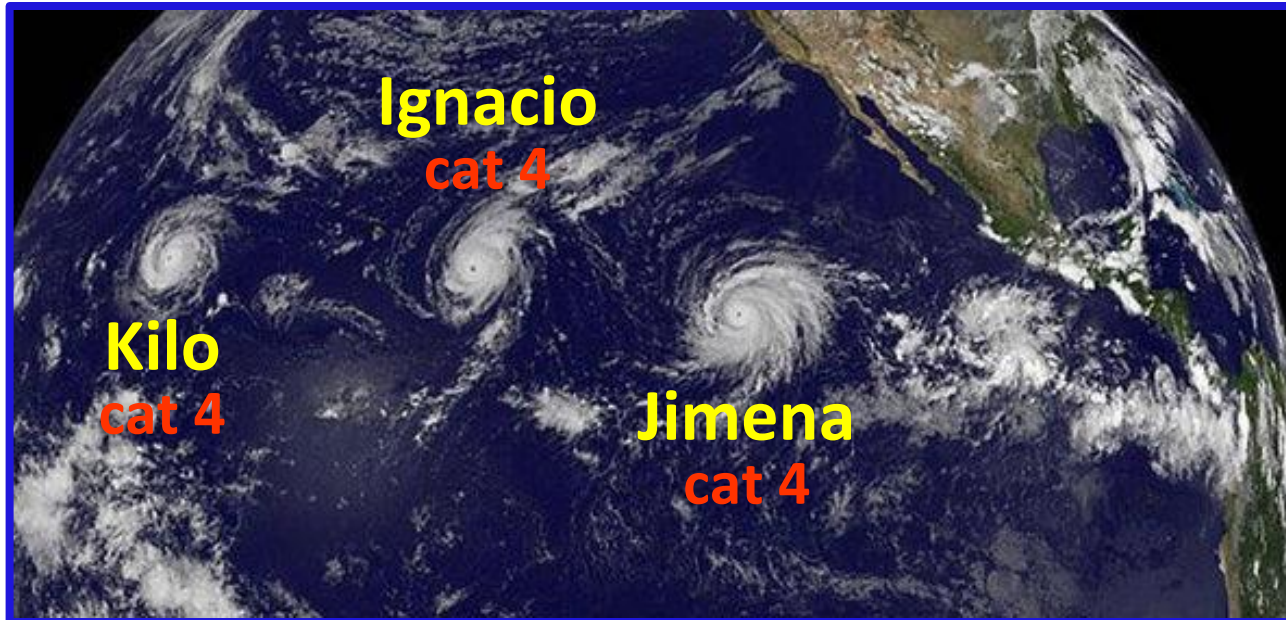
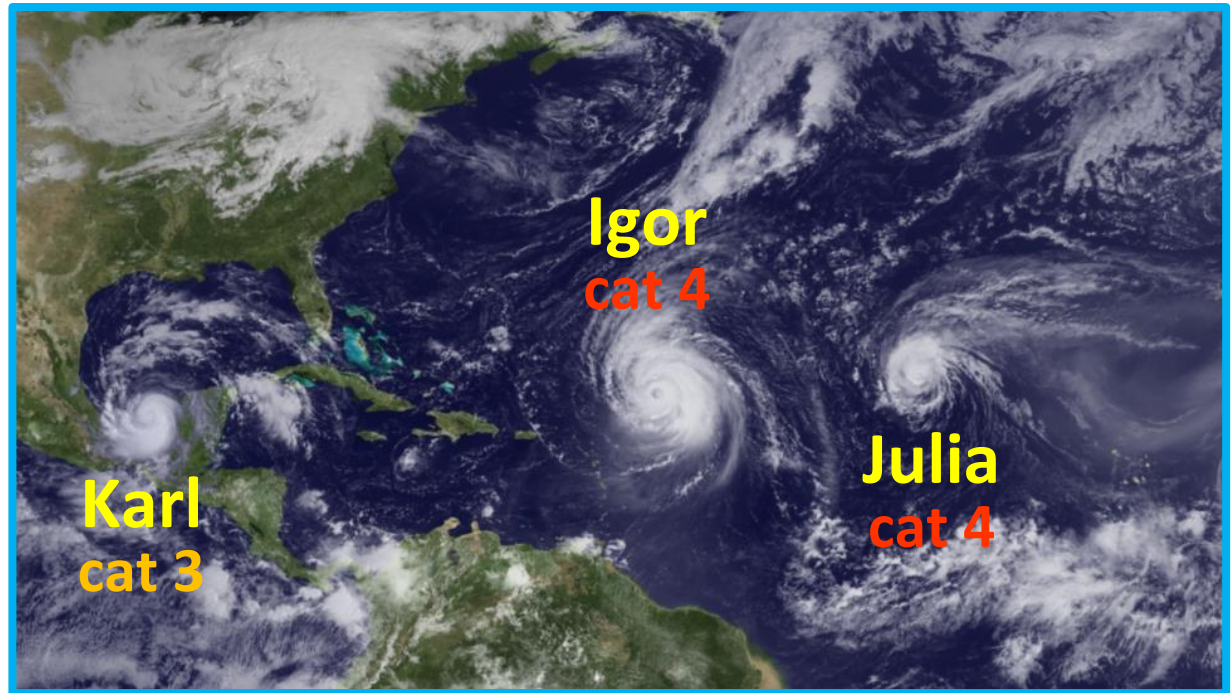
What are the five costliest hurricanes in the United States?

Rank:	Name:	Year:	Cat:	Damage (2015 USD):
1.	Katrina	2005	3*	\$125,000,000,000
2.	Sandy	2012	1*	\$71,400,000,000
3.	Andrew	1992	5	\$43,700,000,000
4.	Ike	2008	2	\$37,500,000,000
5.	Wilma	2005	3	\$25,400,000,000

**Katrina was cat 5 at its peak at sea; Sandy was cat 3.*

At Once...

North
Atlantic
Basin,
09/19/10



Pacific
Basin,
08/31/15