


## Menacing Beauty: The Seductive Power of Hurricanes

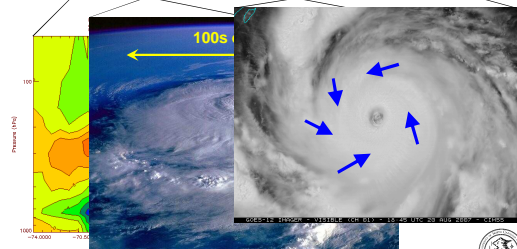



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April 17, 2010

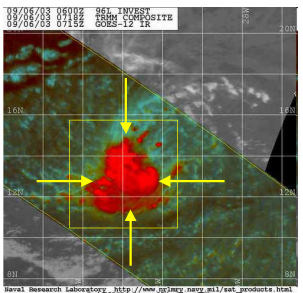
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## What is a Tropical Cyclone?

A *warm core* synoptic scale storm with a closed circulation


## Birth of a Tropical Cyclone



08/06/03 0600Z 08/06/03 0718Z 08/06/03 0718Z  
REL. INUSST COMPOSITE  
CORR. 12 24

Hawaii Research Laboratory: HIRLP //www.hawaii.edu/hawaii\_products.html

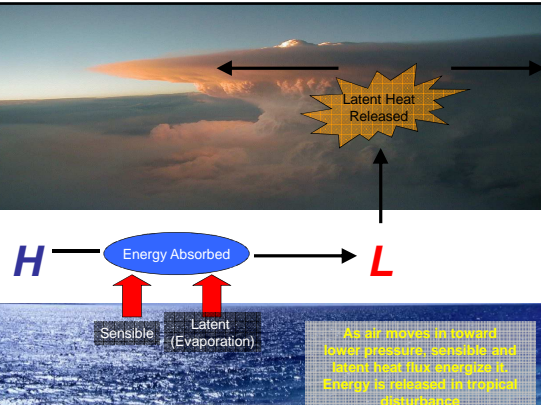
Tropical Disturbance  
September 6, 2003, Atlantic Ocean



Red colors from this satellite image show deep "convection", or areas of strong thunderstorm activity

Water vapor is changing phase to water droplets, releasing energy that we call "latent heat"

This allows for more thunderstorm development (warm air rises), which draws in more warm, moist air from the surroundings. Surface pressures fall.



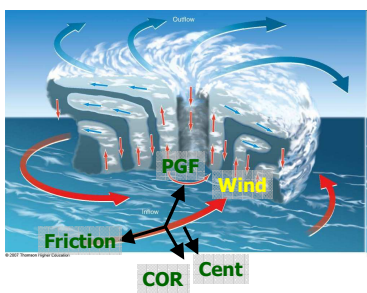
**H** — **Energy Absorbed** — **L**

Sensible Latent (Evaporation)

Latent Heat Released

As air moves in toward lower pressures, sensible and latent heat fluxes combine. Energy is released in tropical disturbances

## Wind Forces and Spin




PGF Wind Friction COR Cent

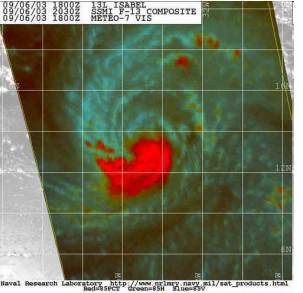
As air rushes in toward the developing low, the curvature and spin of the Earth induces cyclonic rotation in the northern hemisphere

This results in a cyclonic (counter-clockwise) flow around the center of the low

Ultimately the wind forces balance between the pressure gradient, coriolis (earth spin), friction, and centrifugal forces.




## Tropical Storm



08/06/03 1800Z 08/06/03 1800Z 08/06/03 1800Z  
ISABEL COMPOSITE  
RETRD-7 VIS

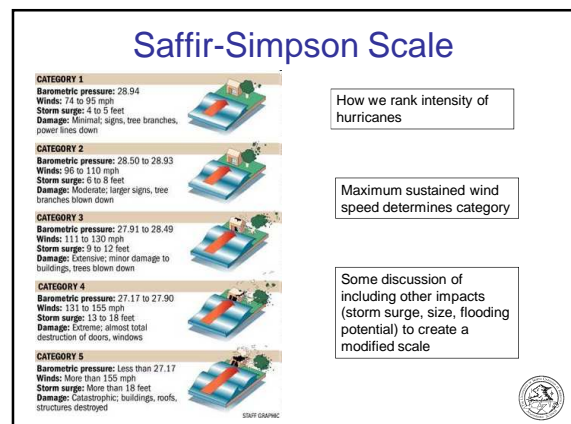
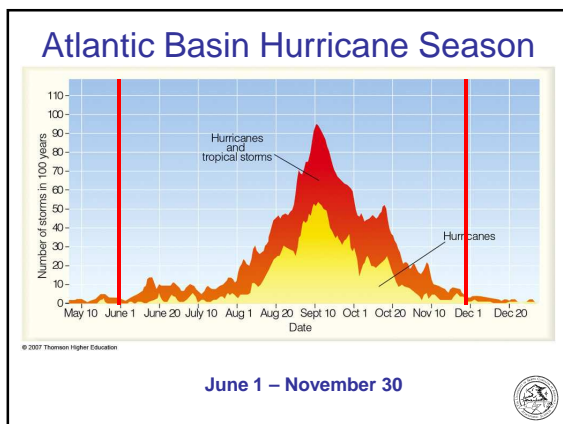
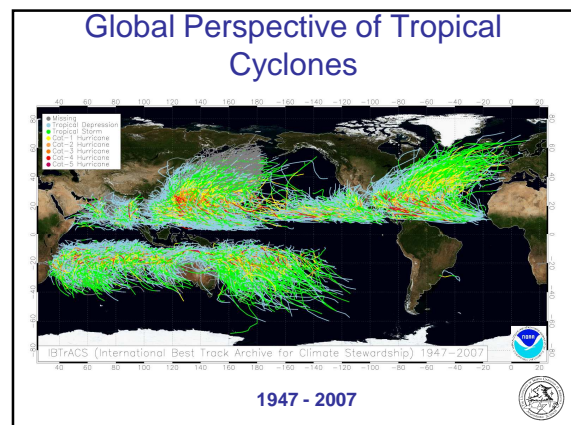
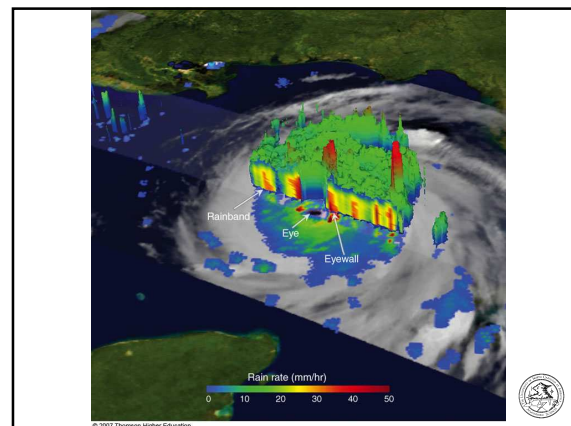
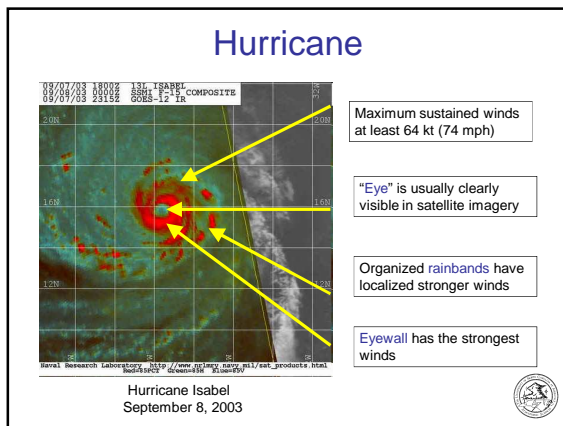
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Tropical Storm Isabel  
September 6, 2003

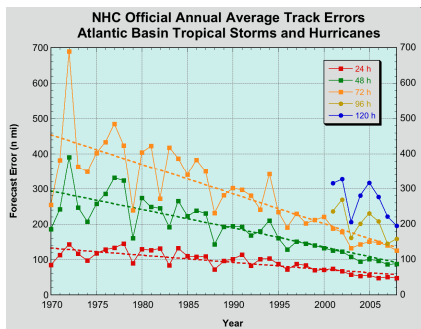


Maximum sustained winds between 34 kt (39 mph) and 63 kt (73 mph)

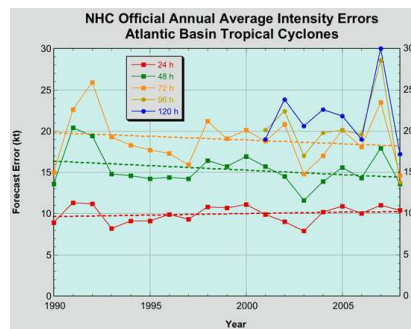
Generally no eye feature (may be covered by clouds in the strongest tropical storms)



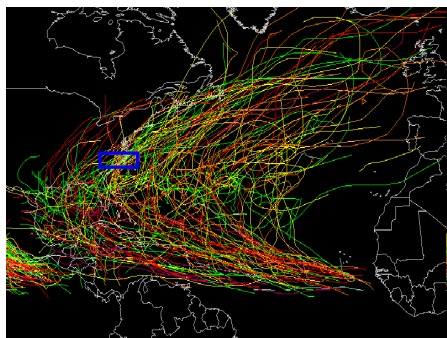
### Forecasting Tropical Cyclones



### Forecasting Tropical Cyclones



### North Carolina Hurricanes



### Famous NC Hurricanes

**Hurricane Hugo**  
(September 1989)

**The Charlotte Observer**

**NIGHT OF FURY**

Category 4 Hurricane, 90 mph wind in Charlotte, thousands of trees lost, 29 NC counties disaster areas

### Famous NC Hurricanes

**Hurricane Floyd**  
(September 1999)

Category 3 Hurricane, 130 mph winds, large storm (almost 1000 km across), 2.6 million evacuated, 35 fatalities in NC

Human/animal waste, fertilizers, soils, pesticides

### Famous NC Hurricanes

**Hurricane Isabel**  
(September 2003)

Category 2 Hurricane at landfall (Category 5 for almost 2 days in the Atlantic), Hatteras stranded

