Chapter 15
Hurricanes and Nor’easters

* Hurricanes are responsible for astonishing amounts of property damage and loss of life in many regions of the world
* Hurricanes around the globe
  * Atlantic -
    * No hurricanes exist in the Southern Atlantic
  * Western Pacific –
    * Has the highest frequency of storms and stronger systems
  * Indian Ocean and Australia –
  * Most hurricanes occur along the western portion of ocean basins
* Hurricane characteristics
  * Hurricane is derived from the native Caribbean Indian language meaning “big wind”.
  * Most powerful of all storms
    * Sustained winds of (74 mph – 210 mph)
    * Average diameter = (350 mi)
    * Central pressure = ~ 990 mb to 870 mb
* * Well defined surface cyclonic circulation
* Hurricane structure
  *
  *
  • Region of descending air
  • Often cloud free
  • Average diameter = 15 miles
  • Easily detected by radar and satellite
* Eye wall – inside is called the “___________________________”
  * Most intense winds and rain
* Cloud/rain bands – feeder bands
  *
  *
  • Often contains weak tornadoes
  • Easily detected by radar
* Hurricane Formation
  * Tropical disturbance (wave) – disorganized storms with little or no circulation
    * most come from Africa
  * Tropical Depression – disturbances intensify and establish one closed isobar
  *
  *
  * Tropical storm – increased organization
  *
  *
  * Hurricane (typhoon, cyclone) – strong circulation
  *
* Necessary Conditions for Hurricane formation
  *
  *
  • Latent heat release from evaporation and cumulus cloud development
  * Most frequent in late summer and early autumn
Unstable atmosphere without vertical shear
- Upper level outflow enhances storm development
- Once formed it becomes a self-propagating system

Hurricane Movement
- Regulated by trade wind flow, upper level winds, and ocean temperatures
- Sometimes exhibit erratic paths
- Difficult to pinpoint exact paths
- Computer models predict paths

Effect of landfall

Hurricane Destruction and Fatalities
- Wind – gusts can exceed 200 mph
- Heavy rain – rainfall can exceed 30 inches
  - Flooding creates the most fatalities
- Tornadoes - Usually form in right front quadrant

 endured by the same direction cause water to rise up
- People delay their evacuations and get caught on roads

Underdeveloped Countries
- Lack the recovery / reconstruction abilities
- Lack the infrastructure
- Often towns are built on low lying waterways
  - Bangladesh and Calcutta India
  - Hundreds of thousands of people die when a cyclone hits the Bay of Bengal

Hurricane Forecasts and Advisories
- Data from satellite observations, surface observations, aircraft (dropsondes)
  - Statistical, dynamic, and hybrid computer models
- Hurricane watches and warnings
  - Difficulties in exact prediction and strength
  - Limited to 72 hours
- Hurricane intensity scale

Recent (and Future?) Trends in Hurricane Activity
- Recent increases in hurricane activity likely related to the

  - 25-40 year oscillation in water temperatures
  - Mid-1990s – warm phase shift
- Global warming links?
  - No evidence to support a global warming link to increased hurricane frequency / magnitude

Setting the Stage for Disaster
The city continues to sink and sits in a bowl as water is pumped out and the city. Two events that could lead to disaster are:
- Large flood of the Mississippi River
- Hurricane with a large enough surge to swamp the city

Few evacuation routes would quickly become flooded.

The Storm
- Developed off the east coast of Florida and made landfall as a category 1 hurricane
- Strengthened into a category 5 in the Gulf of Mexico
- Hit the Mississippi delta as a category 4

- Pressure dropped to 902 mb
- Storm surge reached 30 feet
- Winds exceeded 150 mph with higher gusts
- Over 2,000 lost their life mostly due to flooding

Katrina Slideshow

Nor’easters / Extratropical Storms
- Typically occur in the fall, winter, and spring but predominantly in February
- Nor’easter –
  - Dramatically affects the coast

  - “Storm of the Century” March 12th / 13th 1993
    - Heavy wet snow fell from Florida to Maine
    - Hundreds of Spring Break tourists were trapped

End of Chapter 15

Hurricanes and Nor’easters: The Big Winds