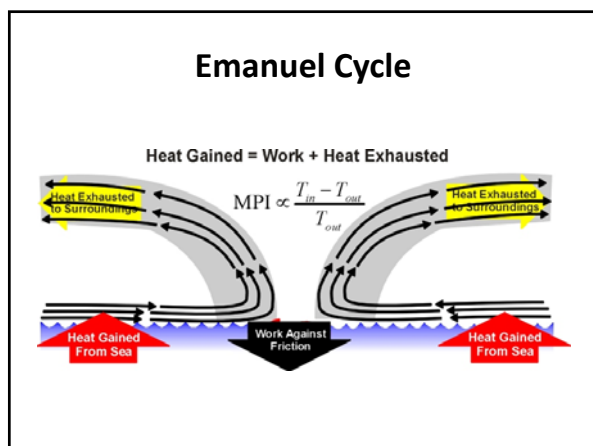
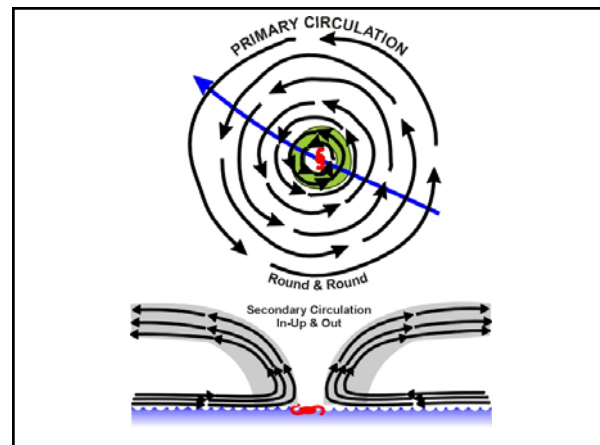
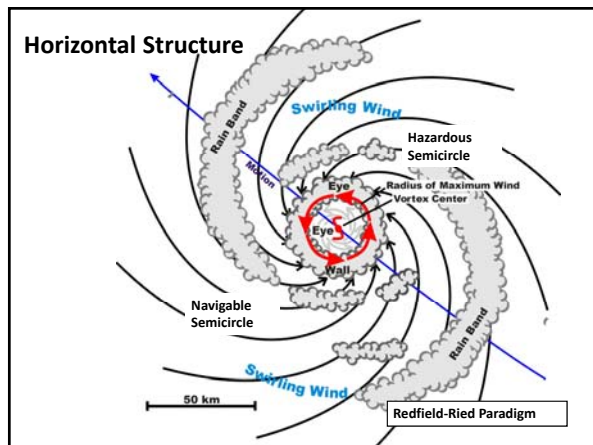


## Advance of Knowledge

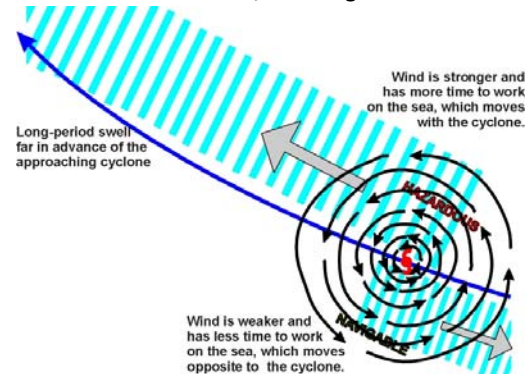
- 1260: TCs first known to Europeans, Marco Polo (Kublai Khan's Japanese adventure)
- Columbus first experienced a TC in 1502
- Redfield & Reid 1831, circular vortex with winds near center much faster than translation
- Fr Viñes first hurricane forecast 1875
- Radio ship reports in 1905
- Advances during the 1940s
  - Radar, Aircraft reconnaissance, upper-air observations
- Satellites:
  - Polar orbiters : TIROS, 1960, succeeded by NOAA
  - Geostationary: SMS, 1974, succeeded by GOES
- Meteorological numerical models and SLOSH starting in the 1960s



### Recurring Hurricane History Themes

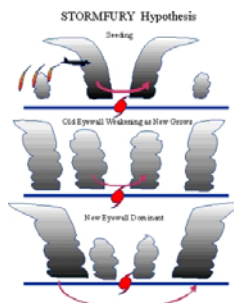
- The tempest devastates a mighty fleet, frustrating the intentions of an ambitious sovereign.
- Mariners, in their voyages of trade or discovery, are lost or cast away.
- A coastal metropolis (or engineering marvel) obliterated
- Economic loss from a hurricane dislocates the national, or world, economy.
- Science advances
- A sagacious forecaster
  - Is heeded, saving thousands, or
  - Is ignored and a multitude go to watery graves
- Nonetheless, impacts fall disproportionately on the economically and socially disadvantaged.

### Redfield & Reid, Including the Ocean

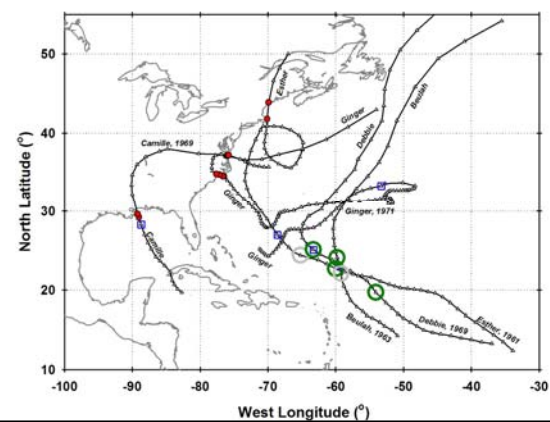


### Revised STORMFURY Hypothesis

- Target intense hurricanes with small eyes
- Seed the first rainband outside the eye
- Build a new eyewall around the old
- New eyewall strangles the old



### STORMFURY Hurricanes



### Storm Surge



Evacuation keeps  
People from drowning in situations like this.

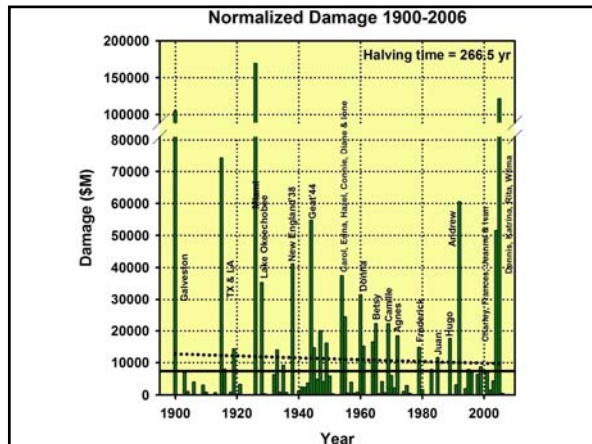
### How Do We Use SLOSH?

- Make many runs for all possible tracks, sizes, intensities...
- Retain greatest extent of inundation for any run
- This defines the Maximum Envelope of Water (MEOW)
- Evacuation-zone boundaries are defined in terms of recognizable landmarks and include the MEOWs for any storm, nonmajor, and major hurricanes.
- Has to be simple, because evacuation is chaotic no matter what.



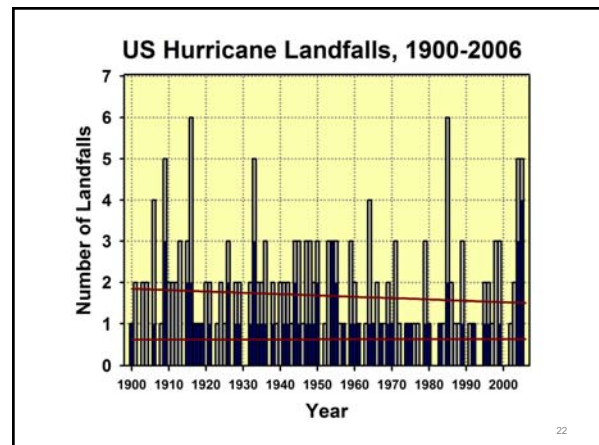
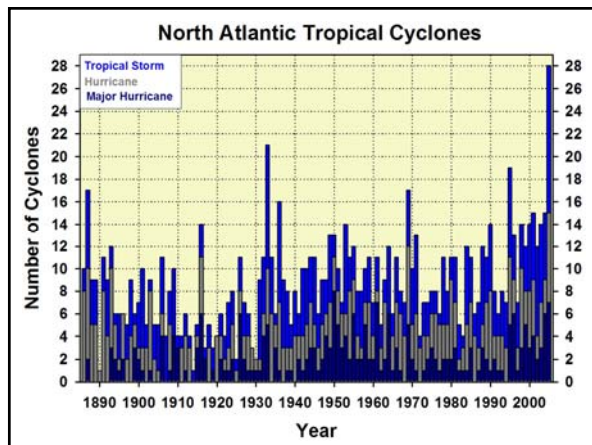






## Human Impact

- Injury and death, of course
- Immediate destruction of property and homes
- Institutions and businesses already under stress relocate or close (Homestead AFB)
- Impacts fall disproportionately on people made vulnerable by:
  - Health
  - Gender
  - Economic status
- Examples
  - Manufactured or "legacy" housing
  - Aged and infirm
  - Retirees on fixed incomes
  - Single women with children
  - Minimum wage, temporary, or seasonal workers
  - Immigrants
  - Poorly trained or uneducated



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## What *Does* It All Mean?

- Advancing scientific knowledge
- Hurricanes are predictable disasters
  - We know they will surely come some day
  - We forecast them fairly well on a day-to-day basis
- We can protect ourselves and our property through:
  - Emergency planning & response
  - Building codes
  - Land use planning
  - THINKING!
- Disasters fall most heavily on those most vulnerable due to poor health, age, social isolation, poverty, gender...
- The good news is that evacuation keeps people from dying
- Property losses are increasing because of more assets in harm's way.
- But we don't see a climate signal...yet...

**We probably could have saved ourselves, but we were too damned lazy to try very hard ... and too damn cheap.**



Kurt Vonnegut, Jr., 1922-2007  
So it goes...

## Faces of Disaster

