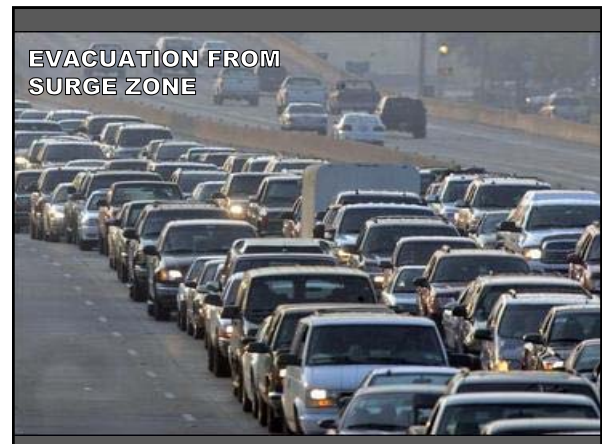
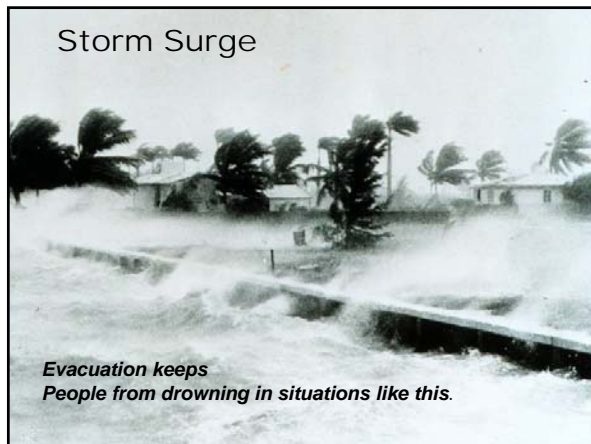
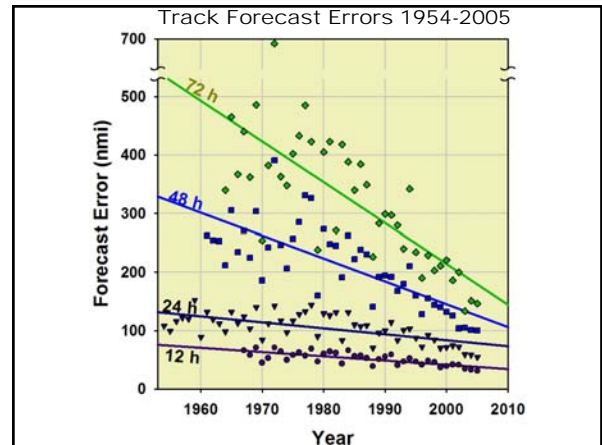
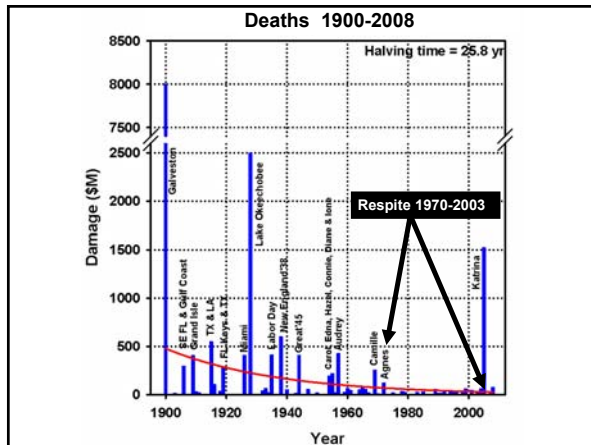
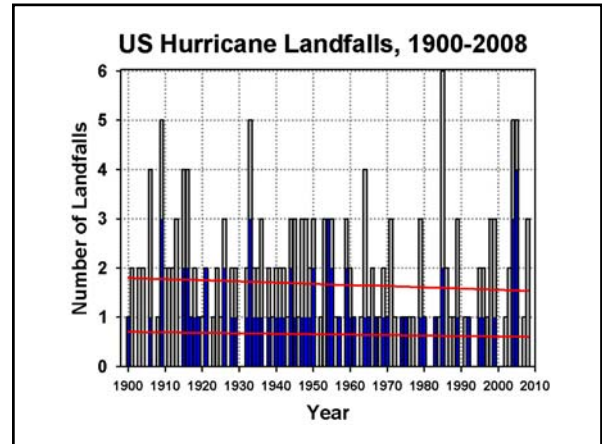
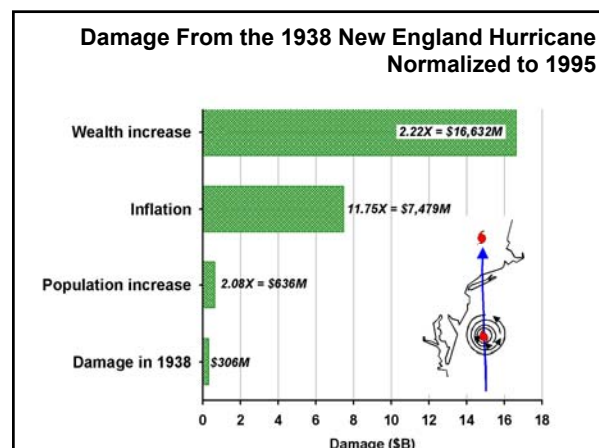
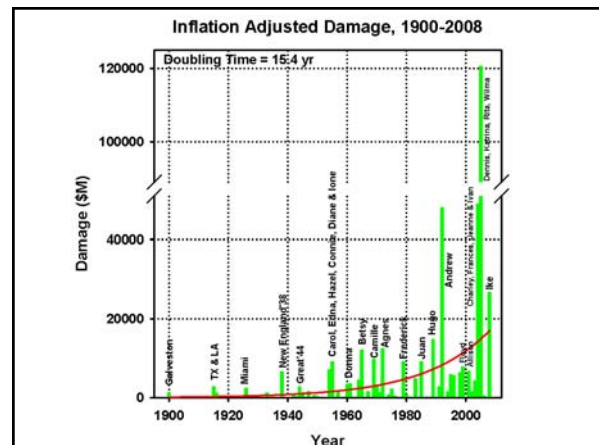
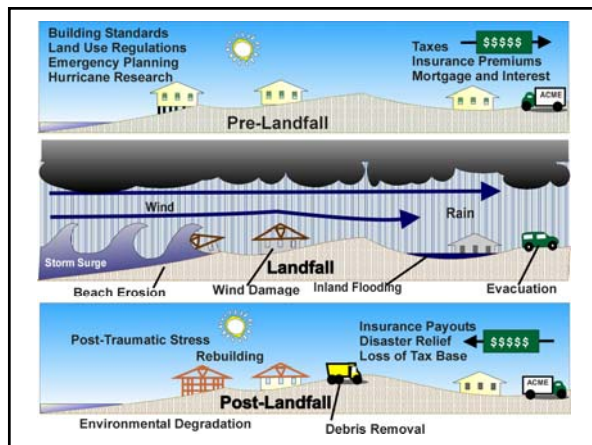
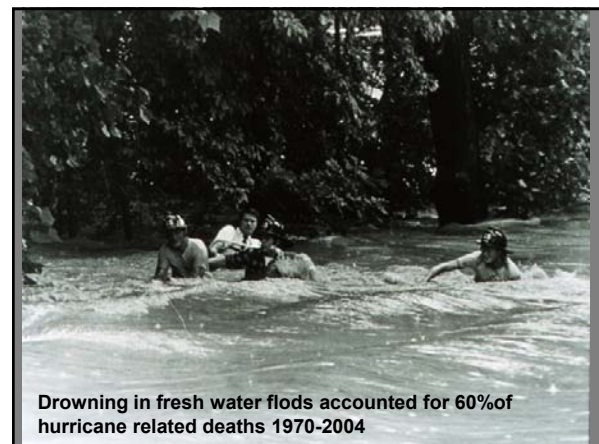
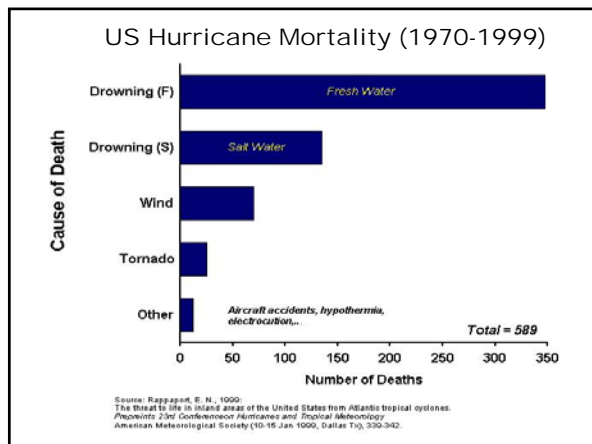
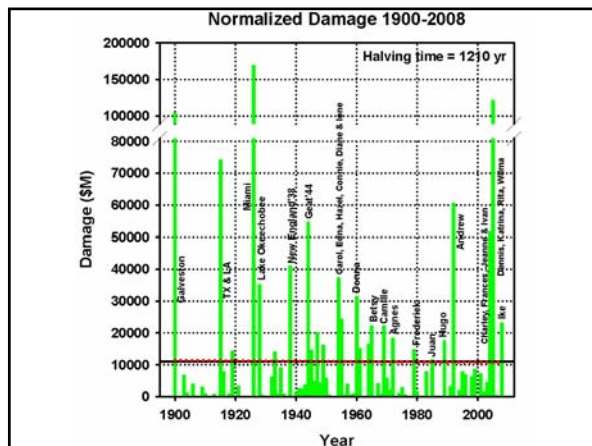


MET 4532

Lecture 35
Human and Economic Impacts
27-29 November 2017







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



Evacuation

- As we have seen, prevents hundreds of deaths a year.
- Who really should evacuate?
 - People who live in the surge zone
 - People who live in manufactured housing
- Otherwise home should be the safest place to be --- at least with reasonable building codes
- Response to evacuation orders is typically 30-70%
- Shadow evacuations from outside evacuation zones
 - Panic or desire to avoid post-storm hardship
- Safe rooms, while not cost effective for preventing death or injury, can prevent shadow evacuation. So can strong building codes.

Why don't people evacuate?

- Distrust of officials
- Don't get the word because of language, isolation...
- Poorly formatted communication
 - "Watches & warnings" vs.
 - "Alerts & Emergencies"
- Aged or infirm
- Shelters don't accommodate pets
- Laziness or complacency
- To safeguard property from storm or looters

The Evacuation Process

- Latency between warning and departure
 - Taking the decision to evacuate
 - Assembling family members
 - Multiple vehicles
- Traffic flow management
 - Traffic moves more slowly as density increases
 - Stoppages due to accidents, drawbridges...
 - Evacuation ends with onset of gale-force winds (nominally)
- Destinations:
 - Official shelters
 - Relative or friends
 - Rental accommodations
 - Anywhere but here
- Can be modeled end-to-end numerically



Post-Storm Environment

- Lack of basic commodities
 - Communications
 - Food & water
 - Fuel, electricity, cash
 - Medical care, law enforcement
- Many buildings uninhabitable or unusable
- Employers shut down or need employees to work despite family obligations
- Restoration can take days to years...

Where do People Go?

- Shelters, hotels, friends & relatives
 - Short term designed to get out of lethal situations
 - Special needs, mental and physical infirmity
- Most will be able to return home
- For those that can't
 - Long-term federal housing (FEMA Trailers)
 - Relocation
 - Eventual restoration of homes

Examples of Disaster Compounding

- Minimum-wage employers lay off workers until repairs are complete or business conditions improve
- Large employers relocate
- Emergency services displace routine social services
- Relief targeted to middle class victims
- Landlords upgrade or go condo, reducing affordable housing stock
- Does anybody look after previously homeless people?
- What about animals, former pets?



Some Observations

- A natural disaster isn't a disaster for everyone (e.g. building trades)
- The rational strategy for a politician in dealing with natural disasters is to not spend political capital on preparation, but to glad-hand the survivors afterward, while offering palliatives.
 - Rich Olson
- Hurricane landfalls are always chaotic, no matter how carefully you plan
- The State of Florida has actually dealt efficiently with hurricane emergencies---Craig Fugate
- One is hard pressed to make a similar statement about windstorm insurance or (to some extent) building standards, but...
- In the 1990s, FEMA became an efficient, focused organization, but many professionals left after 2001 when it returned to its previous mission of providing sinecures for the well connected
- Among all of the significant threats that our civilization faces, Tropical Cyclones are probably the most manageable
- Hurricane forecasting: The inevitable triumph of science and sagacity over ignorance and superstition

Faces of Disaster



Summary

- No trend in hurricane landfalls
 - Lull 1970-2003
- Deaths decrease by 50% every 27 yrs
- Prevention of drowning through evacuation
- Inflation adjusted damage doubles every 14 years because of coastal development
- "Normalization" corrects for inflation, local population and nationwide index of wealth
- No trend in normalized damage
- Both deaths and normalized damage are dominated by a few catastrophic years;
 - 1900, 1926 1928, 2005
 - About one year in four is disastrous.
- Most people survive physically, but the vulnerable ones, economically and physically, suffer most
- Evacuation saves lives, but it's
 - always partial because of latency, traffic flow,
 - Destinations: Shelters, friends & family, hotels, roadside
- Degraded post-storm environments
 - Many lose jobs as well as houses
 - Most will return home after shelters,
 - Relocation, FEMA trailers, or reconstructed homes
- Long term economic disruption