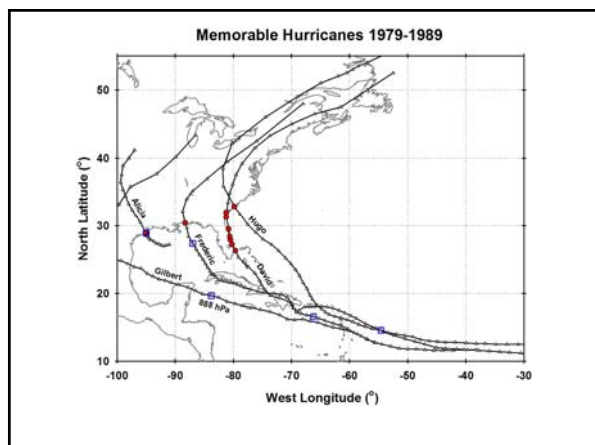
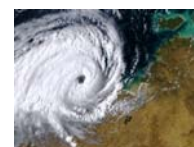


Cyclone Tracy

- Formed on 20DEC74, 500 km NE of Darwin
- Became visible on Darwin Radar on the 22nd as a 50 m/s cyclone
- Slowed and tracked around Bathurst Is
- Moved over shallow warm water
- Intensified and turned toward Darwin late on the 23rd and 24th
- Landfall Christmas morning



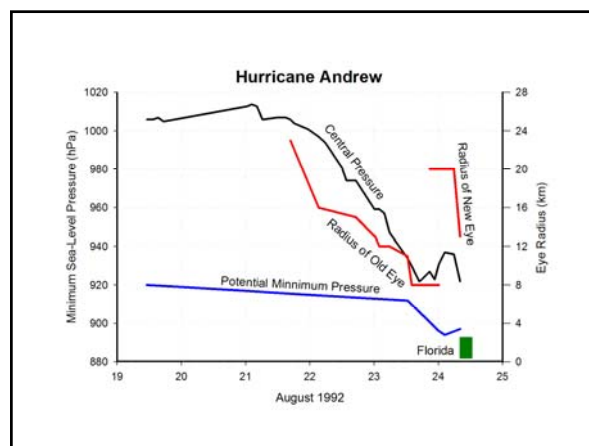
David & Frederic in 1979

- David passed by Miami as a CAT 1
- First real threat since Betsy
- Last direct experience before Andrew
- Killed 12 in the US and did \$1.5B (1979) in damage
- Killed ~2000 on Hispaniola
- Frederic struck Mobile AL 13SEP79 as a CAT 3
- Killed only 5 in the US, but did \$2.3 B (1979) in damage

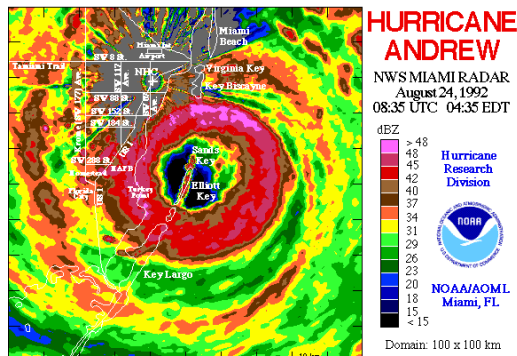


Hurricane Hugo in 1989

- Cape Verde Hurricane
- Intensified in the Atlantic
- N42RF nearly lost in Caribbean
- Struck Guadeloupe, Leeward Is., St. Croix, & eastern Puerto Rico
- Weakened, but then intensified rapidly before landfall N. of Charleston SC.
 - \$7B in US damage (\$10B total)
 - ~50 deaths



Last Sweep of the Miami WSR-57



Impacts

- Damage in S. Florida \$25 B
- Homes
 - 25,524 destroyed
 - 101,241 damaged
- Damage in Louisiana: \$1B
- Deaths
 - Bahamas: 3 direct, 1 indirect (4)
 - Florida: 15 direct, 26 indirect (41)
 - Louisiana: 8 direct, 9 indirect (17)
 - Total 26 direct, 36 indirect (62)
- Closure of Homestead AFB

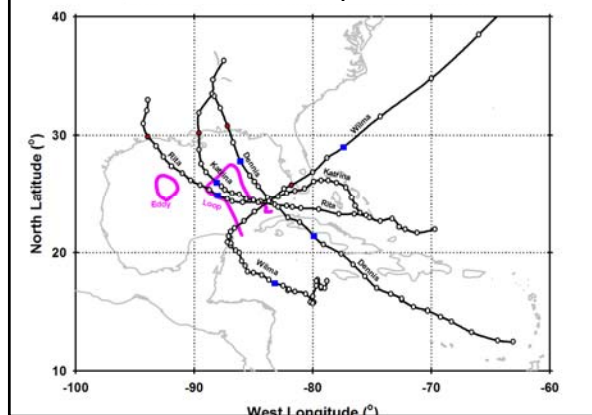
Memorable Hurricanes of 2004

Hurricane	Dates	Damage (US)	Deaths (US)
Charlie (4)	9-14 AUG	\$14B	10
Ivan (4)	2-24 SEP	\$13B	25
Frances (2)	25 AUG-10 SEP	\$9B	7
Jeanne (3)	13-28 SEP	\$8-11B	6

Memorable Hurricanes of 2005

Hurricane	Dates	Damage	Deaths
Dennis (4)	4-13 JUL	\$5-9B	32
Katrina (5)	23-31 AUG	\$70-130B	~1500
Rita (5)	17-26 SEP	\$8-11B	6
Wilma (5)	15-25 OCT	\$12-20B	5

Role of the Loop Current



After 2005

Year	TS	HH	MH	Comments
2006	10	5	2	Zeta in Dec & Jan, <u>Weak El Niño</u>
2007	15	5	2	Dean & Felix CAT 5 in Caribbean
2008	16	8	5	Gustav and Ike hit the US Gulf Coast. All TCs affected land
2009	9	3	2	Most TCs stayed at sea. <u>Weak El Niño</u>
2010	19	12	5	No US landfalls
2011	18	7	3	Irene affected NE US. Active season
2012	20	10	1	Isaac & Sandy

All seasons (except 2013 and 2014) were active by historical standards, but with relatively few US landfalls

2013-2015 Seasons

- Worldwide, 2013 was inactive and then became very active.
 - Typhoon Haiyan, Extreme CAT 5, LF in Southern Philippines, > 2500 dead
- Atlantic 2014 season was near normal (8,6,2)
 - All storms affected land
 - ACE = 67 compared with 1980-2010 median of 92
 - Deaths 17, Damage US\$ 233M
- The 2015 Atlantic season was also near normal (11, 3, 2 as of 19 NOV 15)
 - El Niño. ACE 55% of normal on 19 NOV 15
 - Hurricane Joaquin (Cat 4) sank MV El Faro
 - 33 mariners lost in CAT 4 conditions
- Eastern-Pacific Hurricane Patricia intensified rapidly before landfall in Mexico
 - Set a record for the lowest Western Hemisphere sea-level pressure 890 hPa.
 - EASTPAC ACE 184% of normal before Patricia

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El Faro



- La Niña (sort of)
- Predicted to have above-average activity
- Produced:
 - 15 Named storms
 - 8 Hurricanes
 - 3 Major hurricanes
 - US landfalls by Hermine and Matthew
- Killed 1739, mostly in Haiti
- US impacts ~\$7B, 53 deaths
- Total \$11B, 1365, mostly in Haiti
- Late season Otto in W Caribbean

2016 Season



2017 HURRICANE SEASON

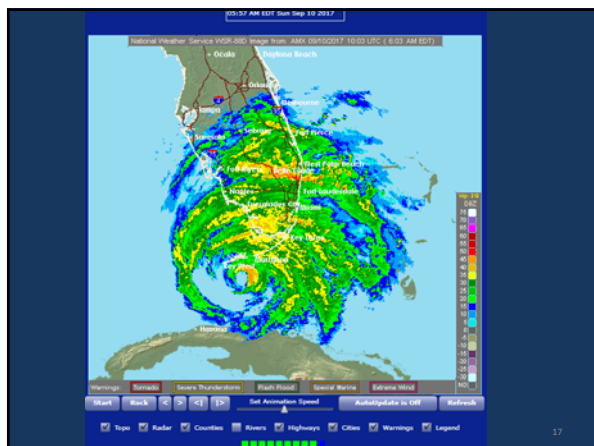
Harvey: CAT 4 TX Landfall. Flooded Houston

Irma: CAT 5 in Caribbean, US CAT 4-3 Landfall in Keys & SW FL

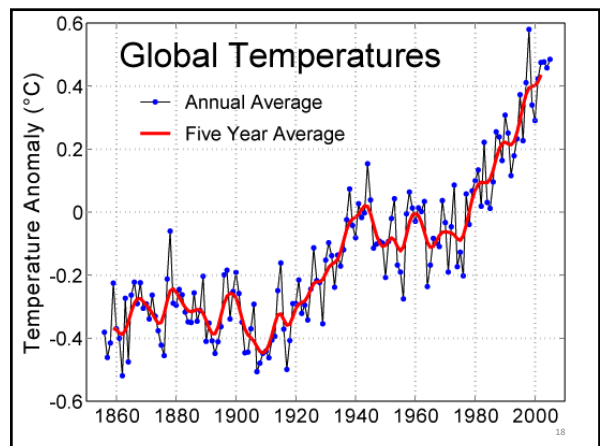
Maria: CAT 4 or 5 in Puerto Rico, Lesser Antilles & Bahamas

Impacts: \$316B (Probably High, \$200+B in US) 315/117 Deaths

16

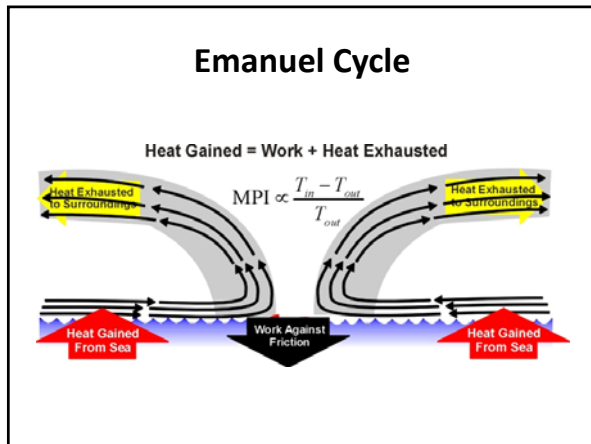


17

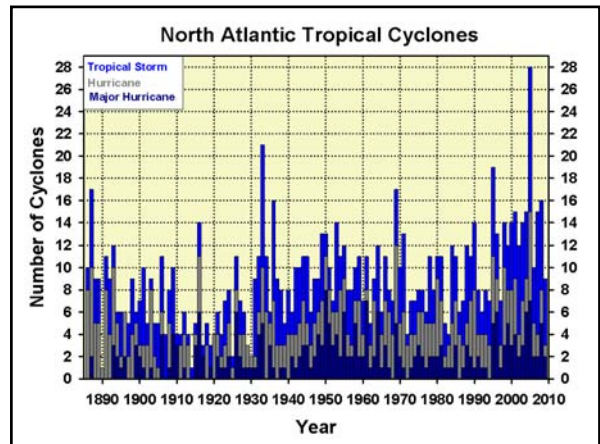


18

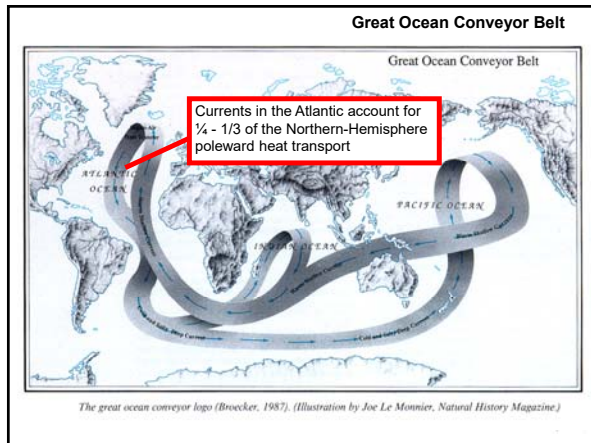
Emanuel Cycle



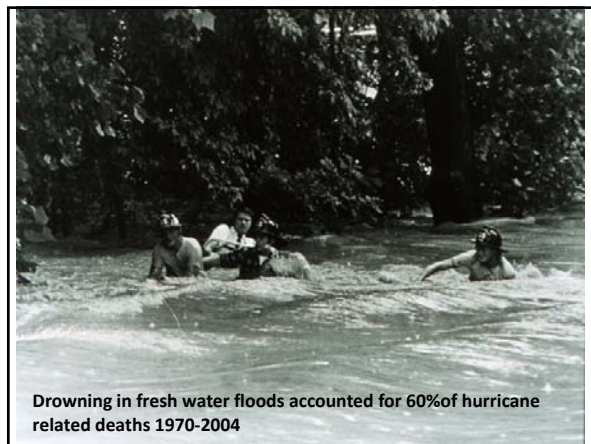
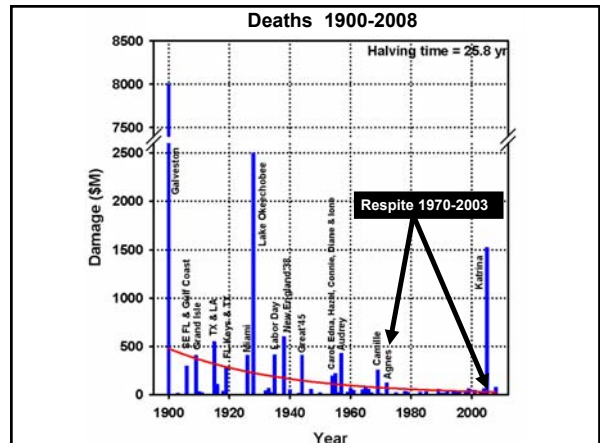
North Atlantic Tropical Cyclones



Great Ocean Conveyor Belt

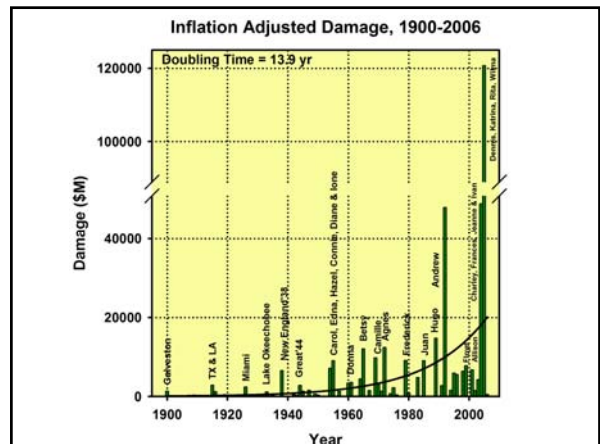


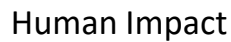
Deaths 1900-2008



Drowning in fresh water floods accounted for 60% of hurricane related deaths 1970-2004

Inflation Adjusted Damage, 1900-2006





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The diagram illustrates a roof truss system. A yellow truss structure is shown above a grey wall. Two curved arrows indicate the transfer of loads from the roof truss to the side walls. The walls are supported by a green foundation. Inside the building, two parallel lines represent the floor joists.



