

MET 4532 Hurricanes

Lecture 2
Columbus, La Floride, Early Science, 1780
23AUG17

Travels in the West Indies
by Theodor De Bry



Columbus

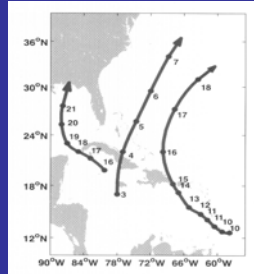
- Noticed hurricane signs on his first voyage
 - Clouds streaming from the SE and a
 - Long-period swell
 - Learned the word “Huracán” from the locals
- Saw the signs followed by a hurricane on his second voyage
- Fourth voyage:
 - Treasure fleet from Santo Domingo ready to return to Spain
 - Conflict with Governor Orvando
 - Columbus saw swell & cloud signs
 - Columbus asked governor for refuge, but was refused
 - Fleet sailed---29 of 30 ships lost
 - Columbus rode out the hurricane in the lee of the Island

La Floride

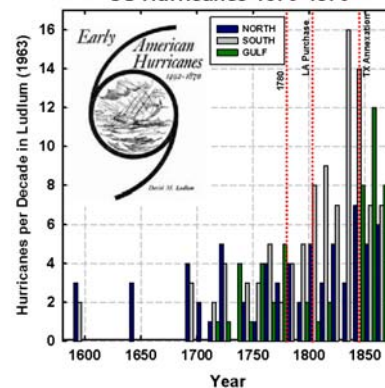
- French Huguenots under Jean Ribaut colonized Florida in the 1560s
- Fort Caroline on St. John's River
- Ponce De Leon had claimed FL for Spain 50 years earlier
- St Augustine was a going concern under Spanish rule
- In September 1565 Ribaut set out to attack
- Shipwrecked in a hurricane south of St Augustine
- As they tried to return to Ft. Caroline, met the Spanish under Pedro de Aviles on the Matanzas River
- Who tricked them into surrendering and massacred them (400 souls)
- De Aviles had already wiped out Ft. Caroline (~250 souls)
- Spain kept FL until 1819, when it was ceded to US in exchange for US promising not to “mess with Texas”

Hurricanes of 1780

- American Revolution still going on
 - Treaty of Paris 1783, Constitution 1789
- Savanna-la-Mar
 - 1-7 October
 - Devastated Jamaica and Sank 6 UK ships
 - Killed ~3000
- Great Hurricane
 - 10-18 October
 - Barbados to Bermuda
 - Killed 22,000
- Solano's Hurricane
 - 15-22 October an armada of 64 sail under de Galvez and Admiral Solano set out to capture Pensacola
 - Ravaged by hurricane for 5 days
 - 2000 died
 - Galvez captured Pensacola the following May
- In all ~27,000 lives lost. Deadliest hurricane season on record



US Hurricanes 1570-1870



Early Hurricane Science

- Differences between steady Trade Winds in the tropics and inconstant westerlies in middle latitudes long recognized by mariners
- Benjamin Franklin realized that many storms move, rather than form in place
 - Lunar Eclipse of 22 OCT 1741 was obscured by a hurricane that moved from Philadelphia to Boston
- John Winthrop measured a pressure of 994 hPa in the 1741 storm at Harvard College in Boston (1013.6 is normal, Torricelli 1644)
- William Dampier.
 - 17th Century navigator and explorer
 - Discourse on Trade-Winds
 - "Typhoons are a sort of violent whirlwind..." (1687)
- William Redfield
 - Self-taught, Entrepreneur (Railroads & Steamships)
 - Noticed opposite tree falls after September 1821 Hurricane
 - A decade later, met Denison Olmstead
 - "On the Prevailing Storms of the Atlantic Coast," *Amer. J. of Sci. & Arts*
 - Studied other storms, geology, paleontology, First president of AAAS



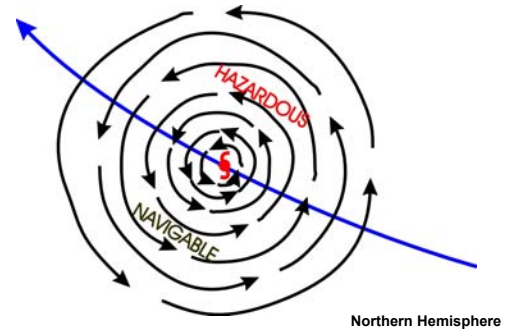
Redfield Quote (1831)

(That) all violent gales or hurricanes are great whirlwinds in which the wind blows in circuits around an axis; that the winds do not move in horizontal circles, but rather in spirals. That the velocity of rotation increases from the margin inward toward the center of the storm. That the whole body of air is, at the same time, moving forward in a path, at a variable rate, but always with a velocity much less than its velocity of rotation.

More Early Hurricane Science

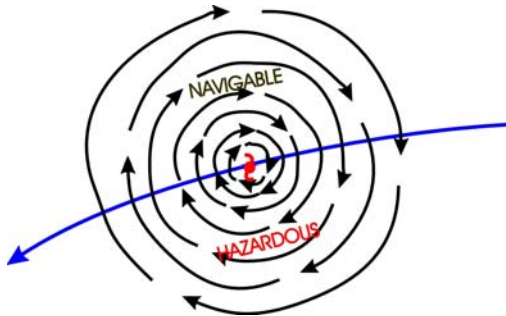
- Col. William Reid, Royal Engineers
 - Directed recovery from the Hurricane of 1831 in Barbados
 - Read Redfield's papers
 - Corresponded with Redfield
 - Analyzed storms in the West Indies, including the Hurricanes of 1780
 - Published *Law of Storms*
- Henry Piddington
 - Ship captain in service of the British East India Company
 - Settled in Kolfata (Calcutta) to study science
 - Influenced by Reid
 - Published his own *Sailors Horn Book for the Law of Storms...* in 1844, complete with transparent chart overlays
 - Coined the word "Cyclone"

Law of Storms



Northern Hemisphere

Law of Storms



Southern Hemisphere

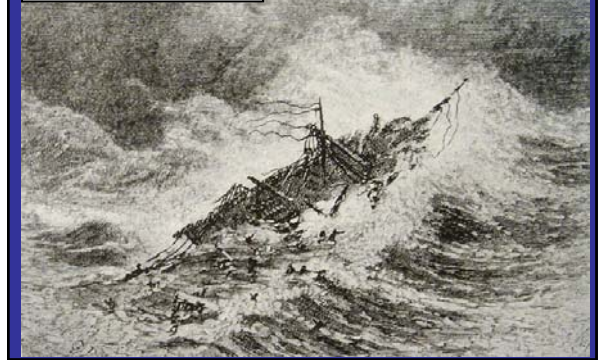


Coming Storm, Winslow Homer, 1901

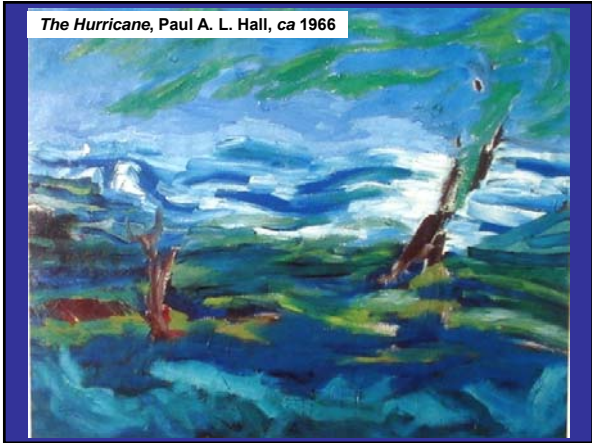
Ships in Distress off a Rocky Coast
by Ludolf Backhuysen, 1667



*Disaster to the Coast Survey Brig
Peter G. Washington in the
Hurricane of September 8 1846,*
Anon, Harper's



The Hurricane, Paul A. L. Hall, ca 1966



Summary

- Columbus: First European encounter a hurricane [1502 (4th voyage), or maybe 1495 (2nd)].
- *La Florida*: Hurricane in 1565 (and old-fashion massacre) left Florida in Spanish hands until 1813.
- 1780: Deadliest hurricane season on record. Three October hurricanes killed 27,000.
- Ludlam's Early American Hurricanes, 1492-1870
- Redfield-Ried Paradigm: "The storm was in the form of a great whirlwind"...1831

Assignments:

Look over notes on
atmospheric structure and
read Emanuel 49-52

See You Next Time