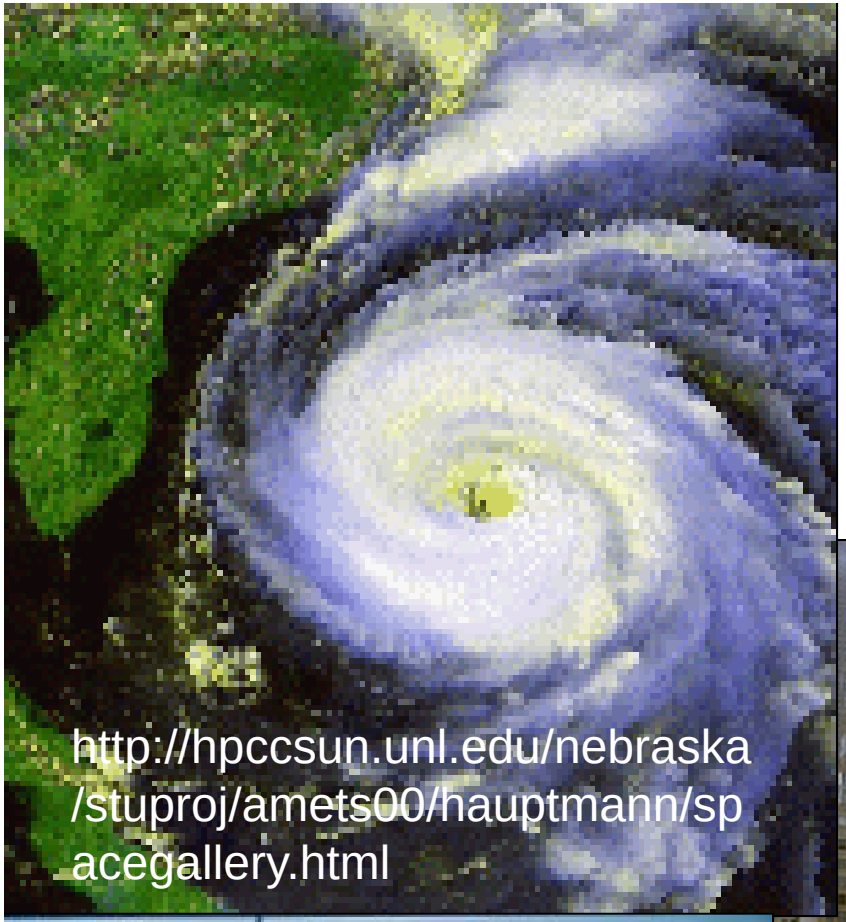
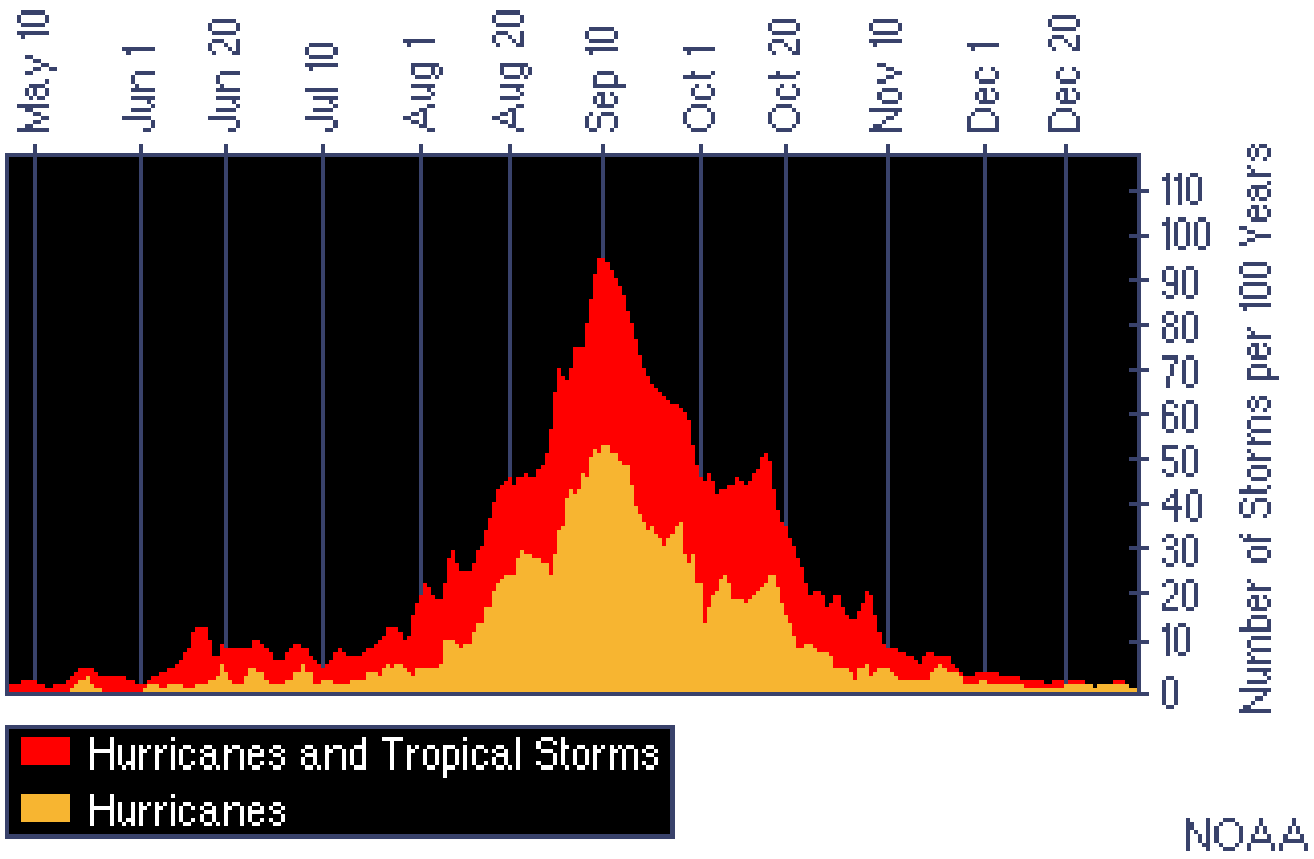
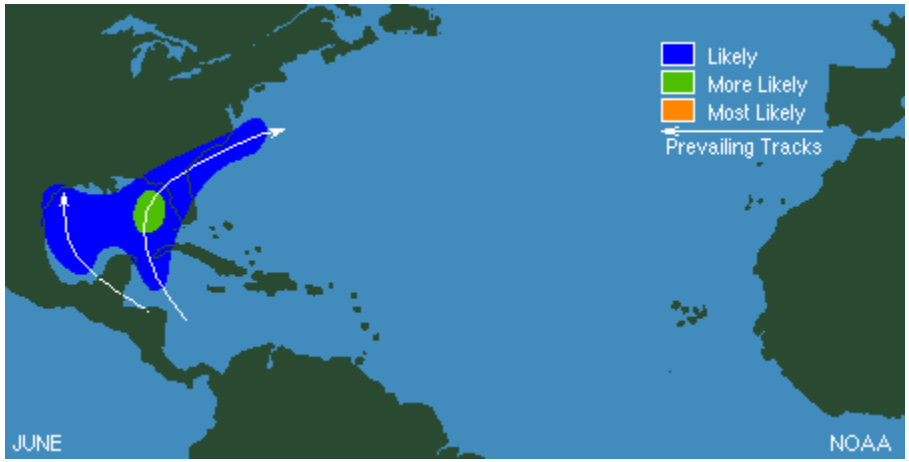
HURRICANES

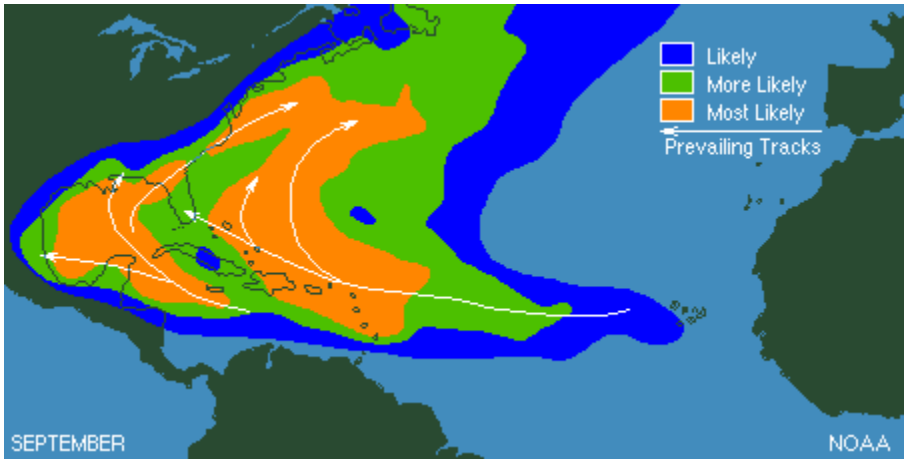
Most information taken from the Tropical Prediction Center (National Hurricane Center) http://www.nhc.noaa.gov/

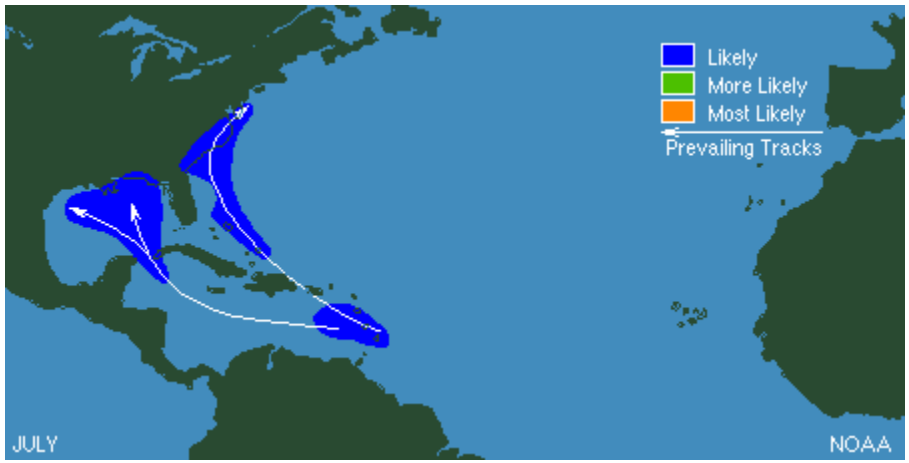


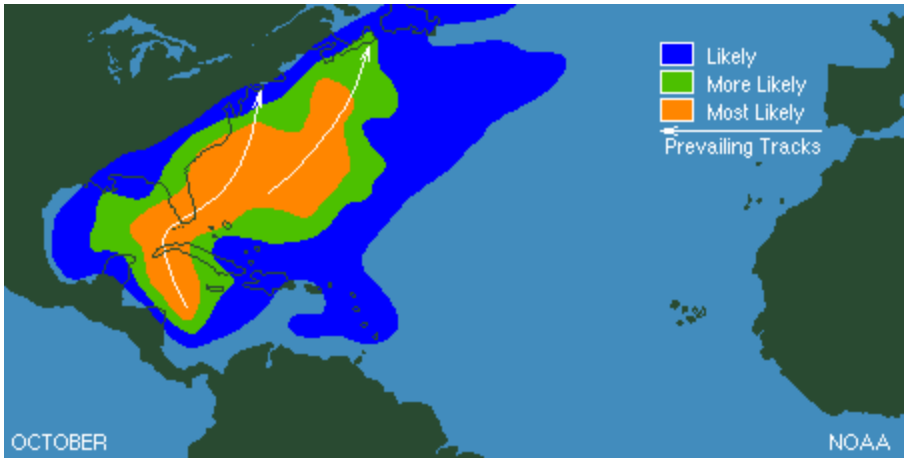


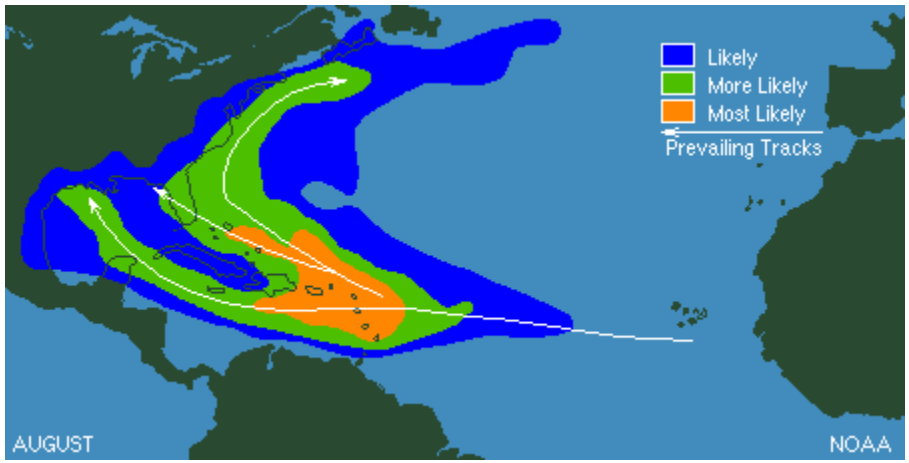
The official hurricane season for the Atlantic Basin (the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico) is from 1 June to 30 November.

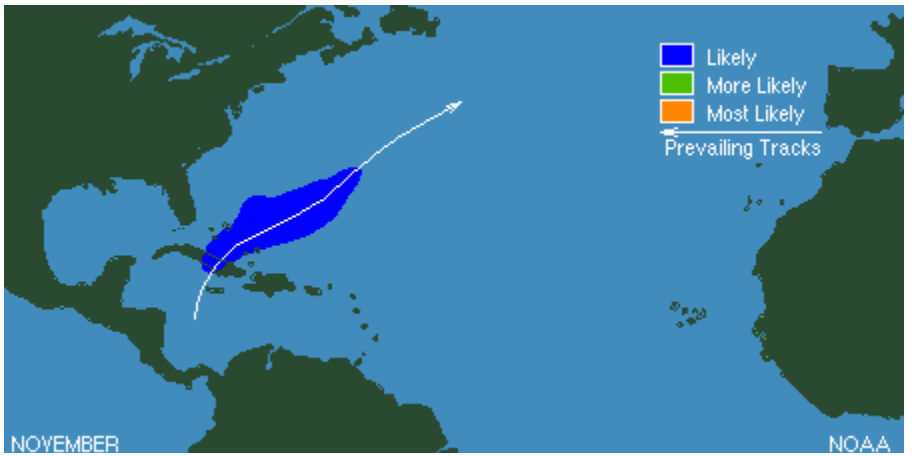

Likely
More Likely
Most Likely
Prevailing Tracks
JUNE
NOAA


Likely
More Likely
Most Likely
Prevailing Tracks
SEPTEMBER
NOAA

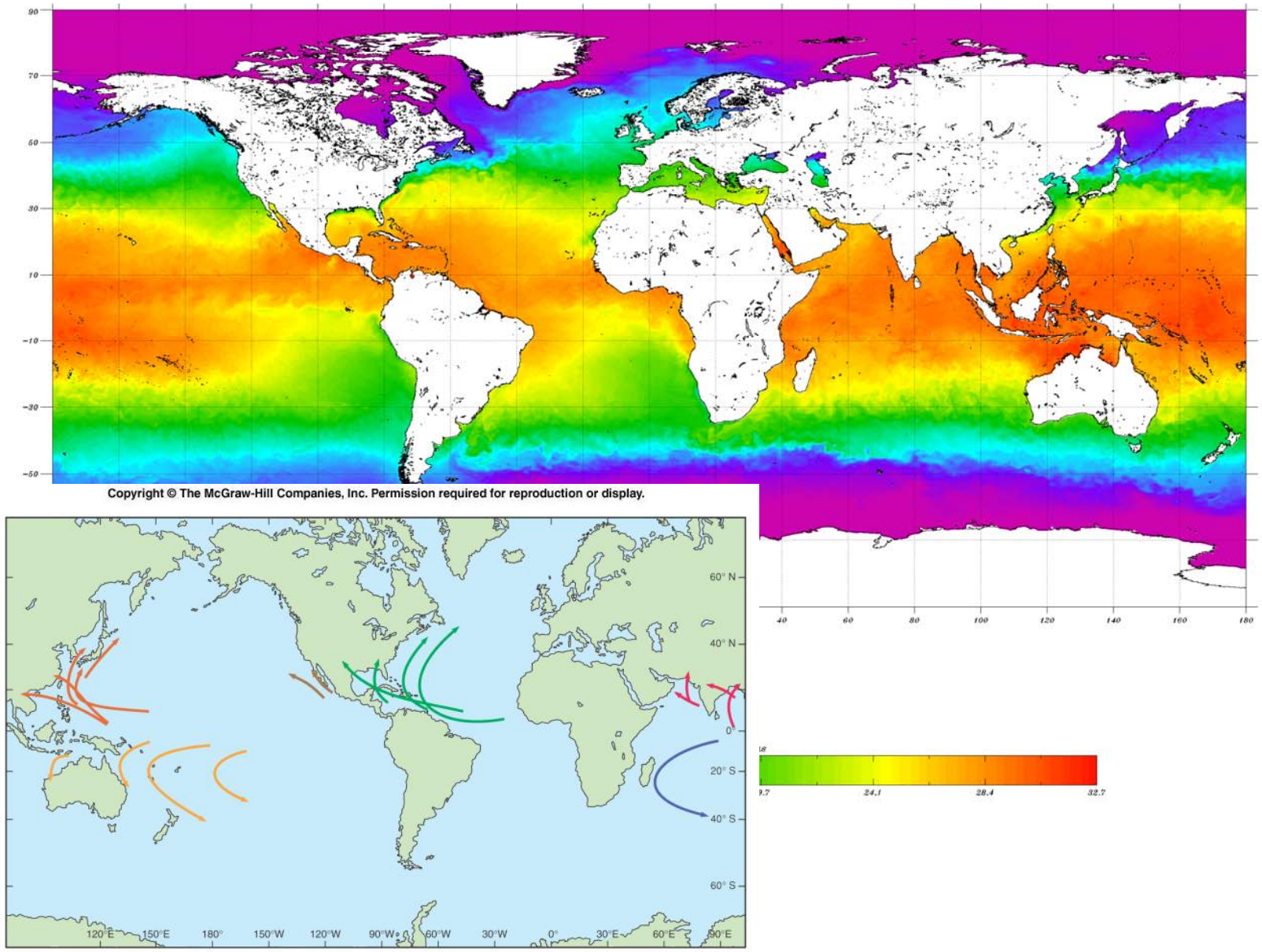

Likely
More Likely
Most Likely
Prevailing Tracks
JULY
NOAA


Likely
More Likely
Most Likely
Prevailing Tracks
OCTOBER
NOAA


Likely
More Likely
Most Likely
Prevailing Tracks
AUGUST
NOAA


Likely
More Likely
Most Likely
Prevailing Tracks
NOVEMBER
NOAA

Hurricanes formation requires Coriolis force.



Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

Western Pacific Ocean = typhoons or cyclones

Hurricane Development

(from www.accuweather.com)

Step 1

Tropical Wave: "bump" or disruption of normal tropical easterly flow. Associated turning of wind causes low-level convergence of air; which helps with falling pressure and enhanced showers.

Step 2

This can evolve into a **Tropical Depression**, which is a closed circulation of air in the low levels. This in turn increases convergence and pressure falls, and wind speeds increase in a Catch-22 effect (i.e. the stronger the wind blows the greater the convergence, the quicker the pressure falls... so the stronger the wind, etc.).

Step 3

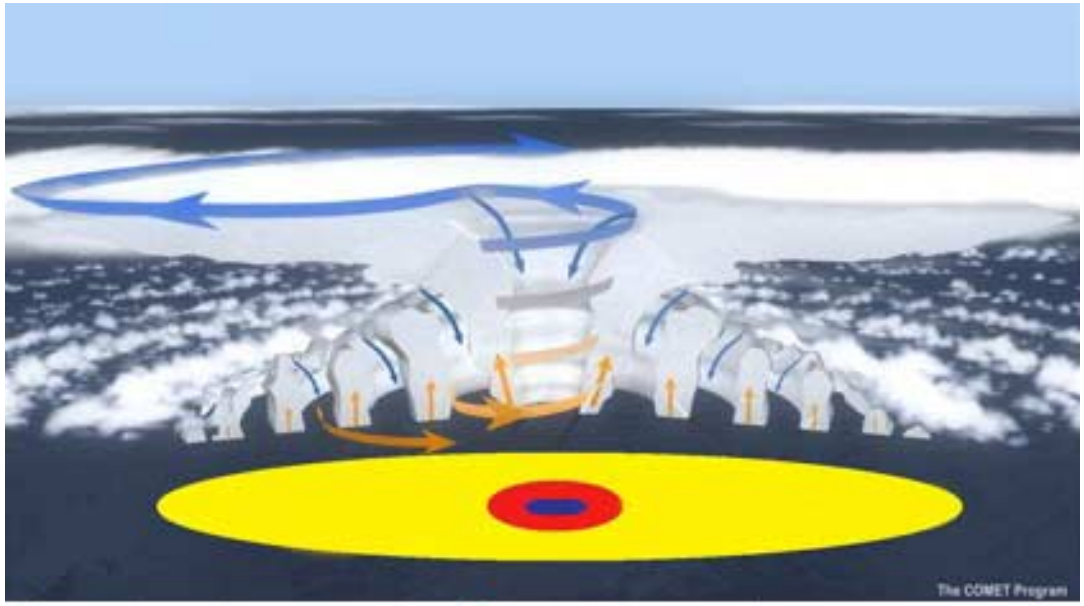
Once sustained winds reach 39 mph in the closed circulation a **Tropical Storm** is named. Usually there are at least 2 closed isobars of 4 mb increments around the center. If atmospheric conditions remain correct the system will evolve into a...

Step 4

Hurricane. There is usually a difference in pressure of at least 0.60 inches of mercury between the center and surrounding pressure field, with the greatest change near the center (eyewall). It is this great difference in pressure, which sometimes can be as great as 2.95 inches of mercury, that causes the wind to be so strong.

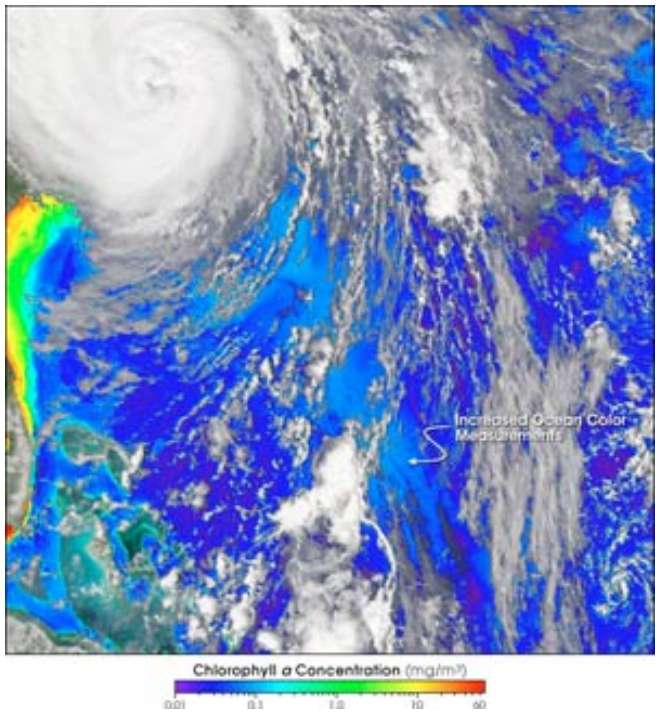
Step 5

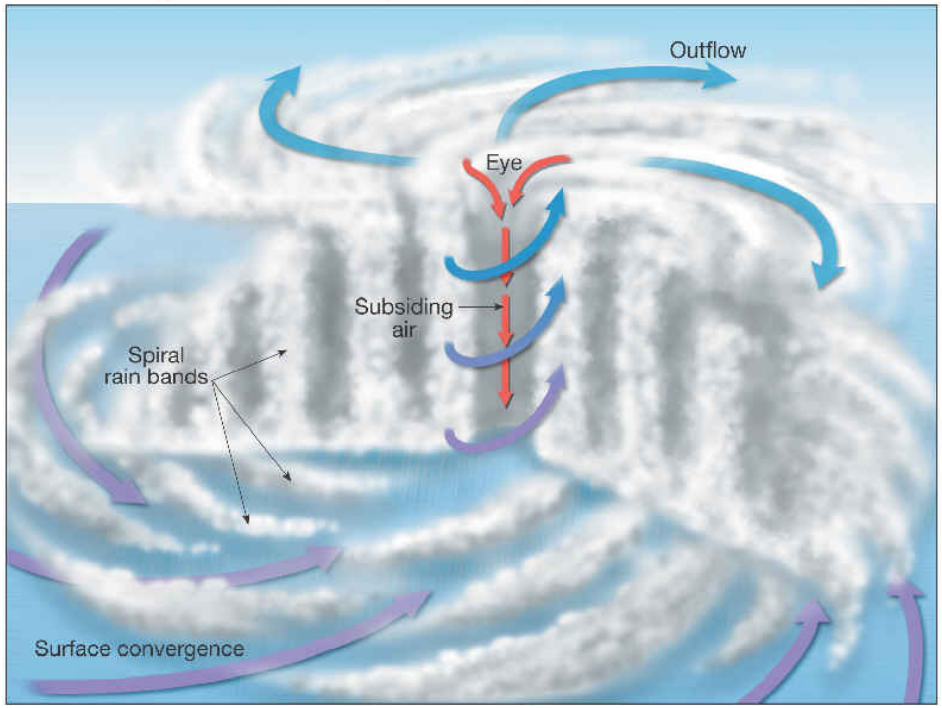
A mature hurricane is a well-oiled meteorological machine, but disruption of the processes that drive the storm (i.e. interaction with land, colder air feeding in, or cold water) will begin to destroy the storm, and the **disintegration of a hurricane** can often be quick and dramatic.

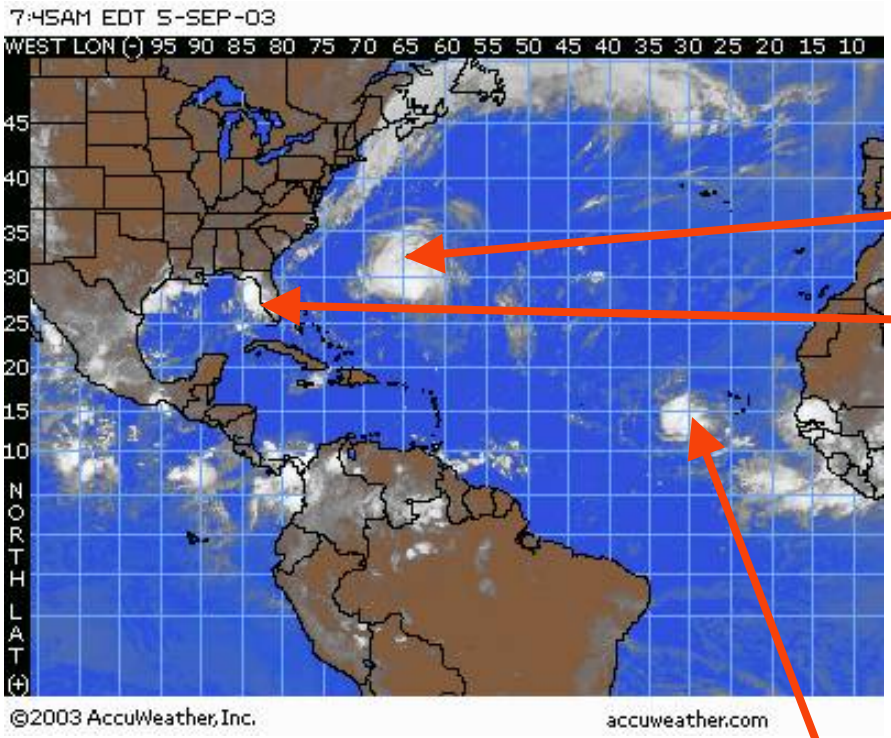


Light Winds *Very Strong Winds*

Transition from very strong winds to light winds at the outer edge







Henri: The relatively slow movement of Henri will mean as much as 8-15 inches of rainfall for parts of Florida. Severe weather is also a possibility in the right quadrant of the storm. We expect Henri to emerge off the east coast of Florida later tomorrow or tomorrow night. This system will probably affect the United States East Coast much of next week.

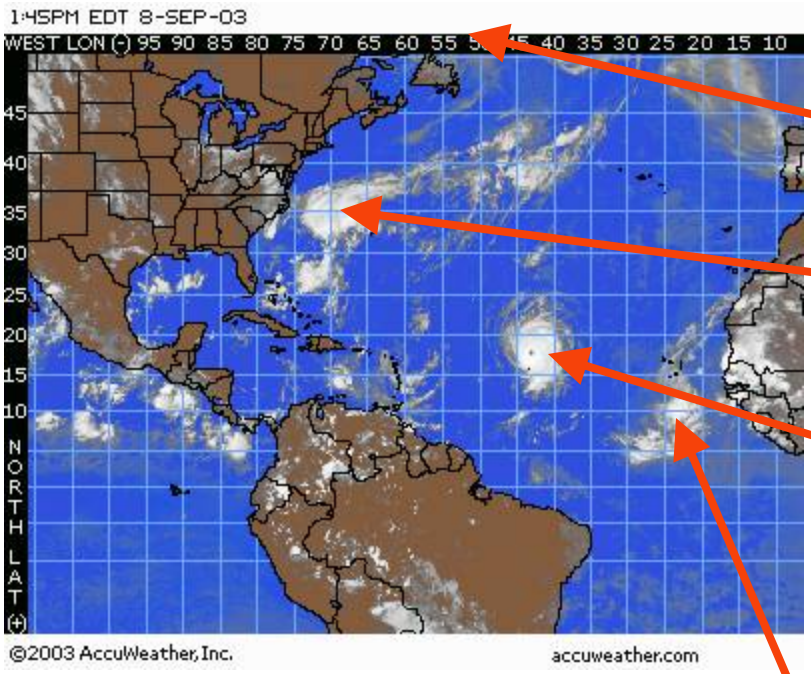
Henri and Fabian Sep 5 2003 (www.accuweather.com)

Hurricane Fabian: 30.1 north, 65.3 west, 155 miles south of Bermuda

Tropical Storm Henri 28.1 north, 84.3 west, or 105 miles west-northwest of St. Petersburg, Florida

Fabian: The hurricane warning remains in effect for Bermuda, as powerful Hurricane Fabian continues to track northward, toward the island. The hurricane is moving northward at 17 mph, with maximum sustained winds of 120 mph. The lowest central pressure is 951 mb (28.08 inches). Hurricane force winds extend as far as 115 miles from the center, while tropical storm force winds are as far out as 230 miles.

Tropical wave: Near Cape Verde Islands, will probably be next named storm



Sep 8 2003 (www.accuweather.com)

Hurricane Fabian: 50 north, 39 west

Tropical Storm Henri 33 north, 76 west

Hurricane Isabelle is way out in the Atlantic, more than 1,200 miles east of the Leeward Islands, as of 11 a.m. AST. Isabel has strengthened to a category 3 hurricane, with 115-mph maximum sustained winds, and is moving west-northwest at 14 mph. This motion will take Isabel near or north of the Leeward Islands on Friday

Tropical Depression #14

Saffir-Simpson Scale

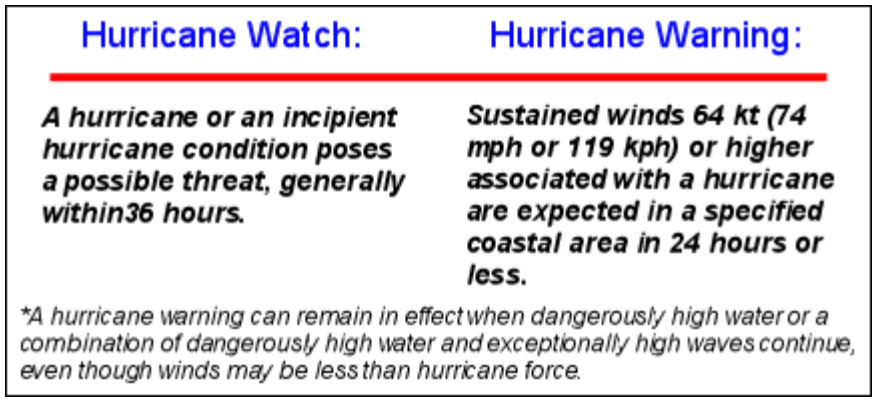
The chart color codes intensity (category based on Saffir-Simpson scale):

Type	Category	Pressure (mb)	Winds (knots)	Winds (mph)	Surge (ft)	Line Color
Depression	TD	-----	< 34	< 39		Green
Tropical Storm	TS	-----	34-63	39-73		Yellow
Hurricane	1	> 980	64-82	74-95	4-5	Red
Hurricane	2	965-980	83-95	96-110	6-8	Light Red
Hurricane	3	945-965	96-113	111-130	9-12	Magenta
Hurricane	4	920-945	114-135	131-155	13-18	Light Magenta
Hurricane	5	< 920	>135	>155	>18	White

NOTE: Pressures are in millibars and winds are in knots where one knot is equal to 1.15 mph.

http://weather.unisys.com

Tropical Storm
Winds 39-73 mph



Hurricane Watch:	Hurricane Warning:
A hurricane or an incipient hurricane condition poses a possible threat, generally within36 hours.	*Sustained winds 64 kt (74 mph or 119 kph) or higher associated with a hurricane are expected in a specified coastal area in 24 hours or less.*

**A hurricane warning can remain in effect when dangerously high water or a combination of dangerously high water and exceptionally high waves continue, even though winds may be less than hurricane force.*

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hurr/awar.rxml

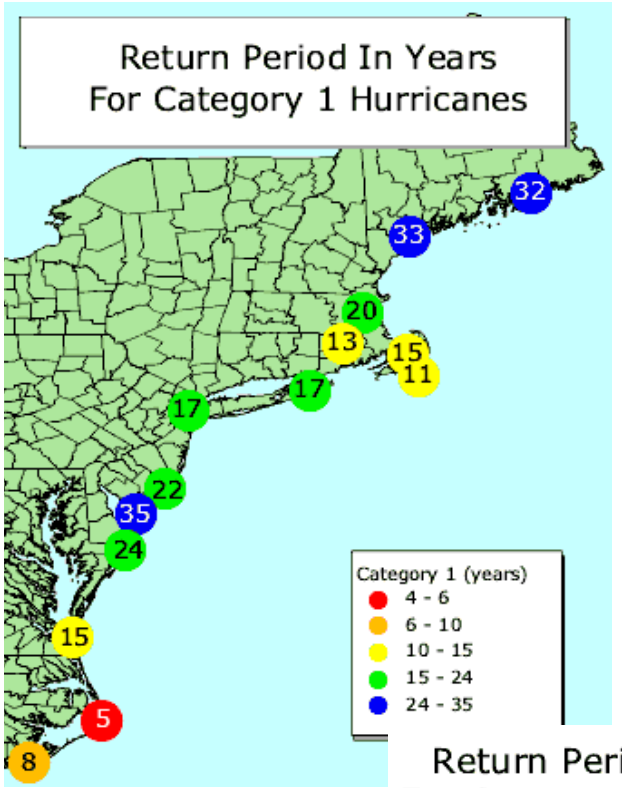
Category 1 Hurricane — winds 74-95 mph (64-82 kt)
No real damage to buildings. Damage to unanchored mobile homes. Some damage to poorly constructed signs. Also, some coastal flooding and minor pier damage.

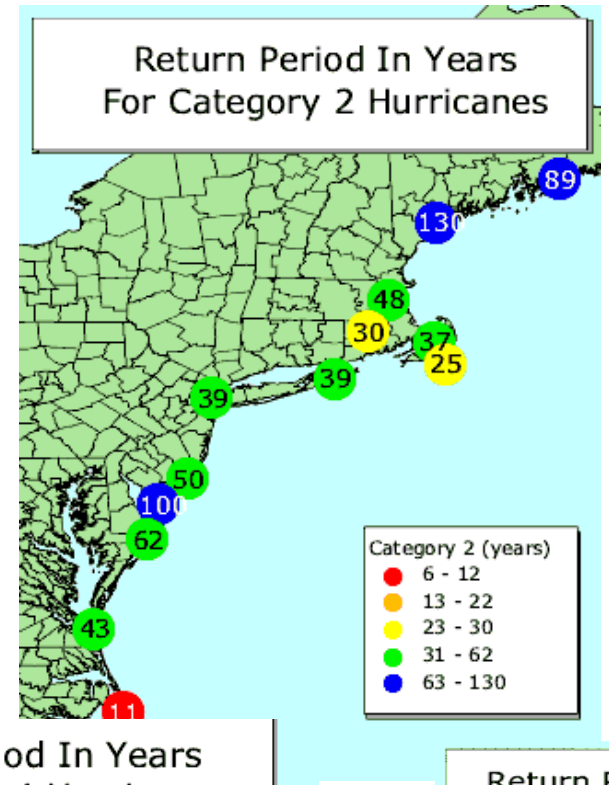
Category 2 Hurricane — winds 96-110 mph (83-95 kt)
Some damage to building roofs, doors and windows. Considerable damage to mobile homes. Flooding damages piers and small craft in unprotected moorings may break their moorings. Some trees blown down.

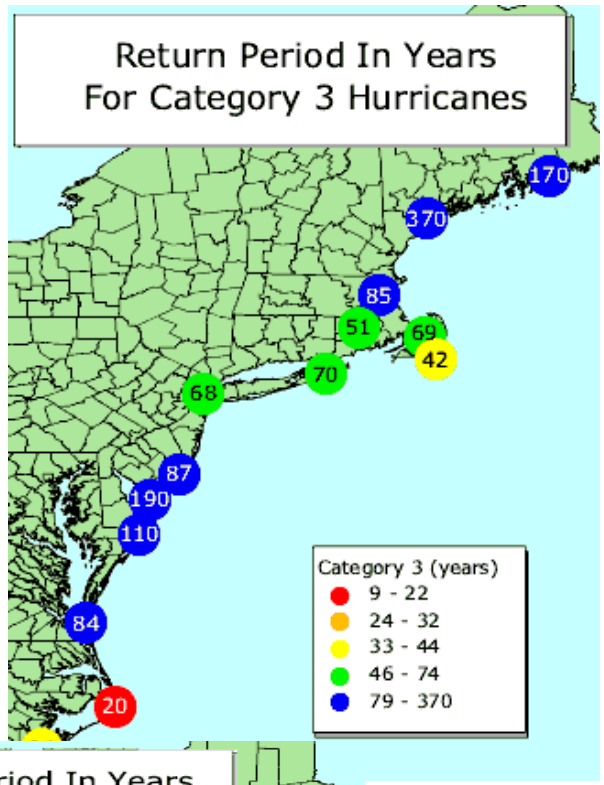
Category 3 Hurricane — winds 111-130 mph (96-113 kt)
Some structural damage to small residences and utility buildings. Large trees blown down. Mobile homes and poorly built signs destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.

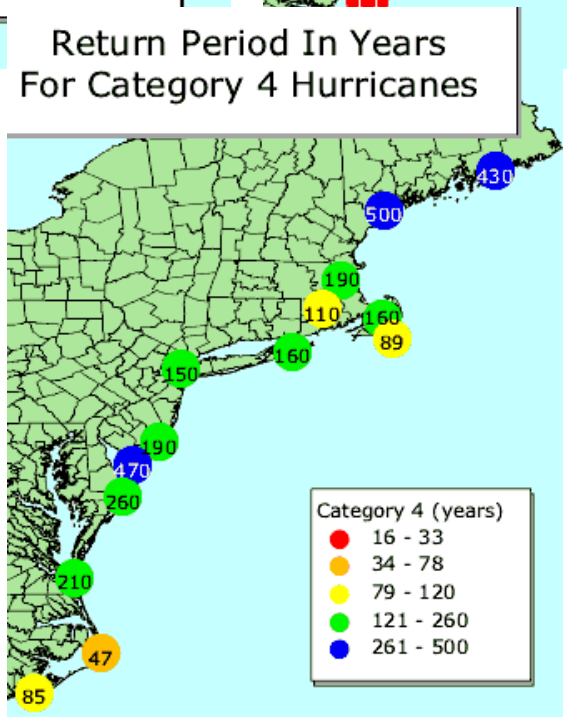
Category 4 Hurricane — winds 131-155 mph (114-135 kt)
More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.

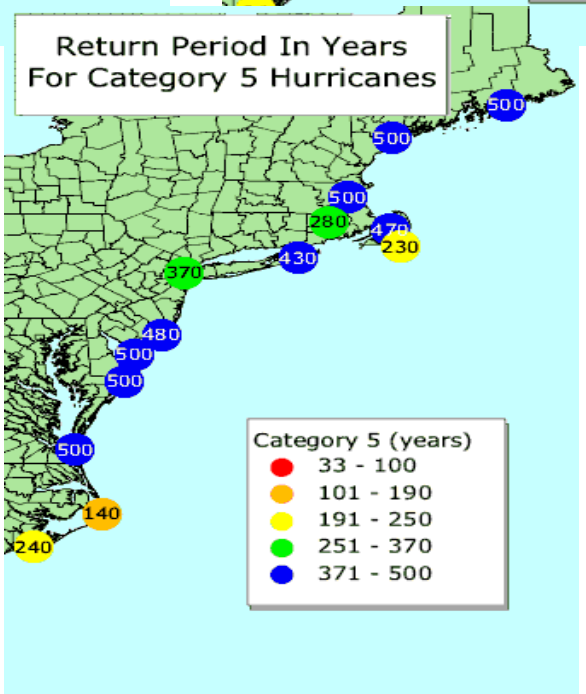
Category 5 Hurricane — winds 156 mph and up (135+ kt)
Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.


Return Period In Years
For Category 1 Hurricanes
32
33
20
13
15
11
17
17
22
35
24
15
5
8
Category 1 (years)
4 - 6
6 - 10
10 - 15
15 - 24
24 - 35

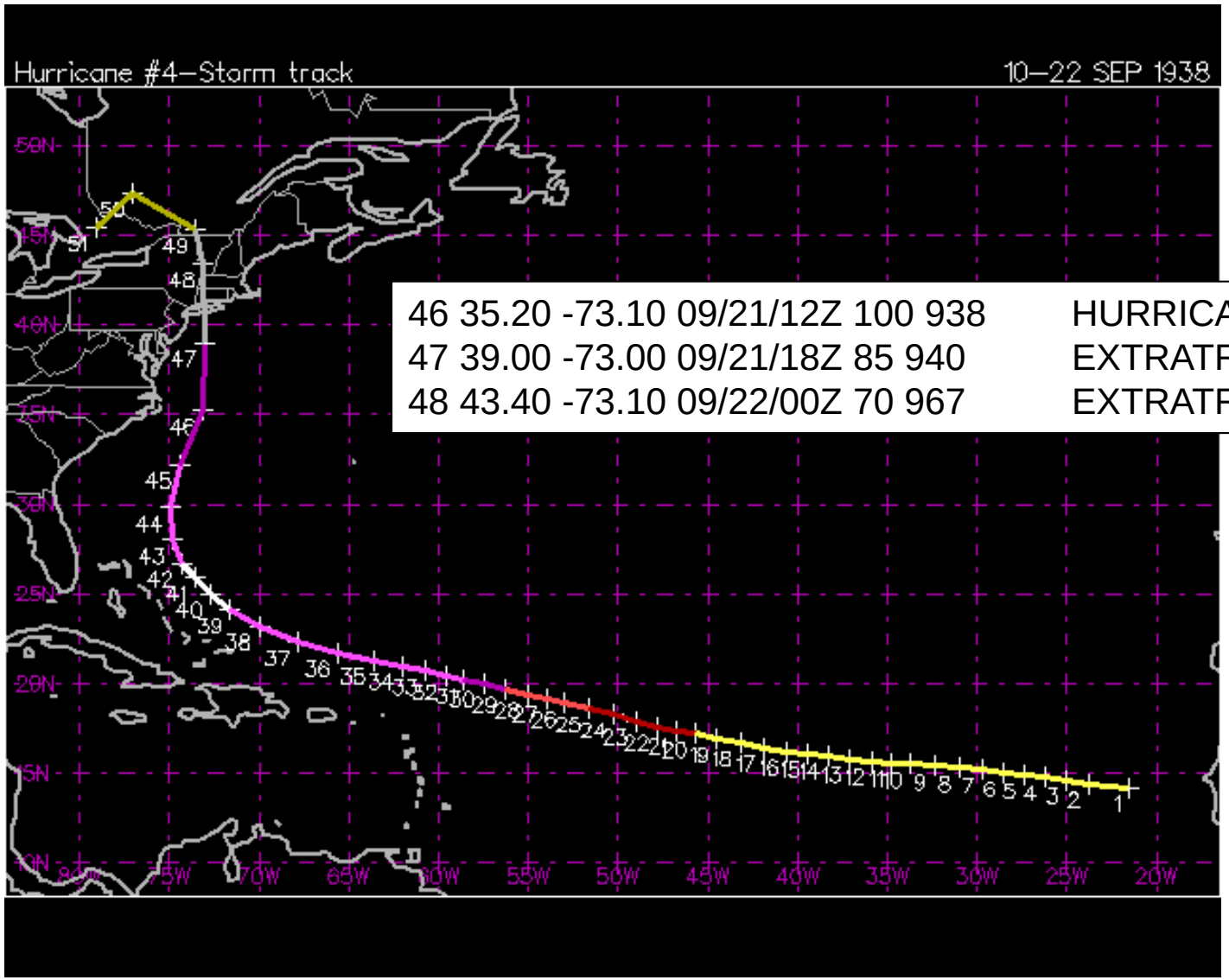

Return Period In Years
For Category 2 Hurricanes
89
130
48
30
37
25
39
39
50
100
62
43
11
Category 2 (years)
6 - 12
13 - 22
23 - 30
31 - 62
63 - 130


Return Period In Years
For Category 3 Hurricanes
170
370
85
51
69
42
70
68
87
190
110
84
20
Category 3 (years)
9 - 22
24 - 32
33 - 44
46 - 74
79 - 370


Return Period In Years
For Category 4 Hurricanes
430
500
190
110
160
89
160
150
190
470
260
210
47
85
Category 4 (years)
16 - 33
34 - 78
79 - 120
121 - 260
261 - 500


Return Period In Years
For Category 5 Hurricanes
500
500
500
280
470
230
430
370
480
500
500
500
140
240
Category 5 (years)
33 - 100
101 - 190
191 - 250
251 - 370
371 - 500

Great New England Hurricane, 10-22 Sep. 1938, (cat. 5)



http://weather.unisys.com

LONG BEACH, NY Hurricane of 21 September, 1938

NY District, USACE

Reported Impacts

Formation of new inlets

Overwash and destruction of sand dunes

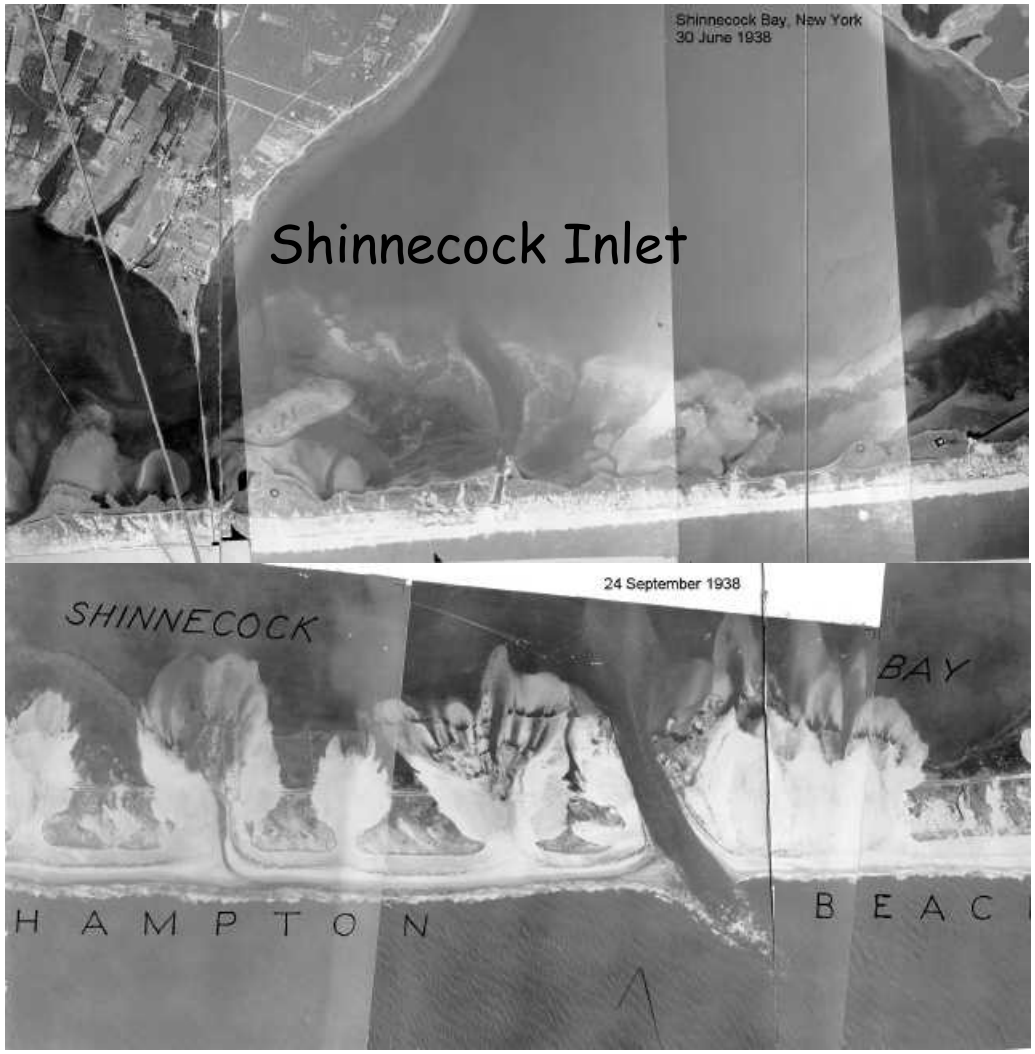
-18 ft above msl

Observed Storm Surge (ft)

Montauk Point	14.7
Westhampton	11.9
Rockaway	9.7

War Department
Beach Erosion Board, 8/6/46

Barrier Island Breaching



6/30/38

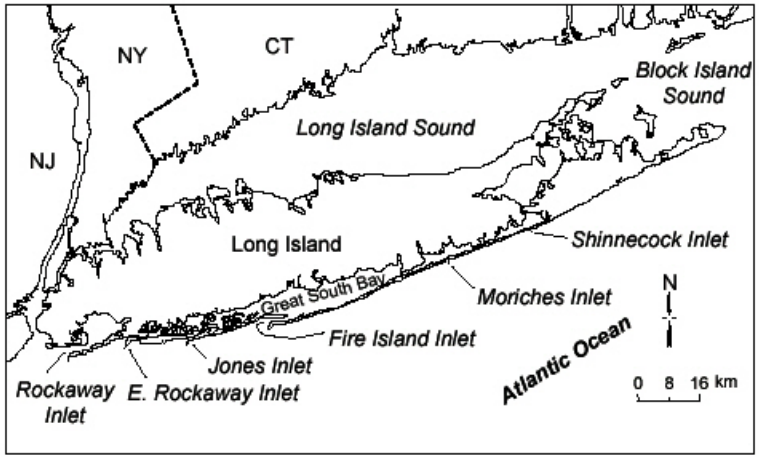


Fig. 1. Location map for the south shore of Long Island, New York

9/24/38

http://www.nhc.noaa.gov/outreach/presentations/Sandy2012.pdf
http://www.weatherwise.org/Archives/Back%20Issues/2013/March-April%202013/hurricane-sandy-full.html

DANGERS FROM HURRICANES

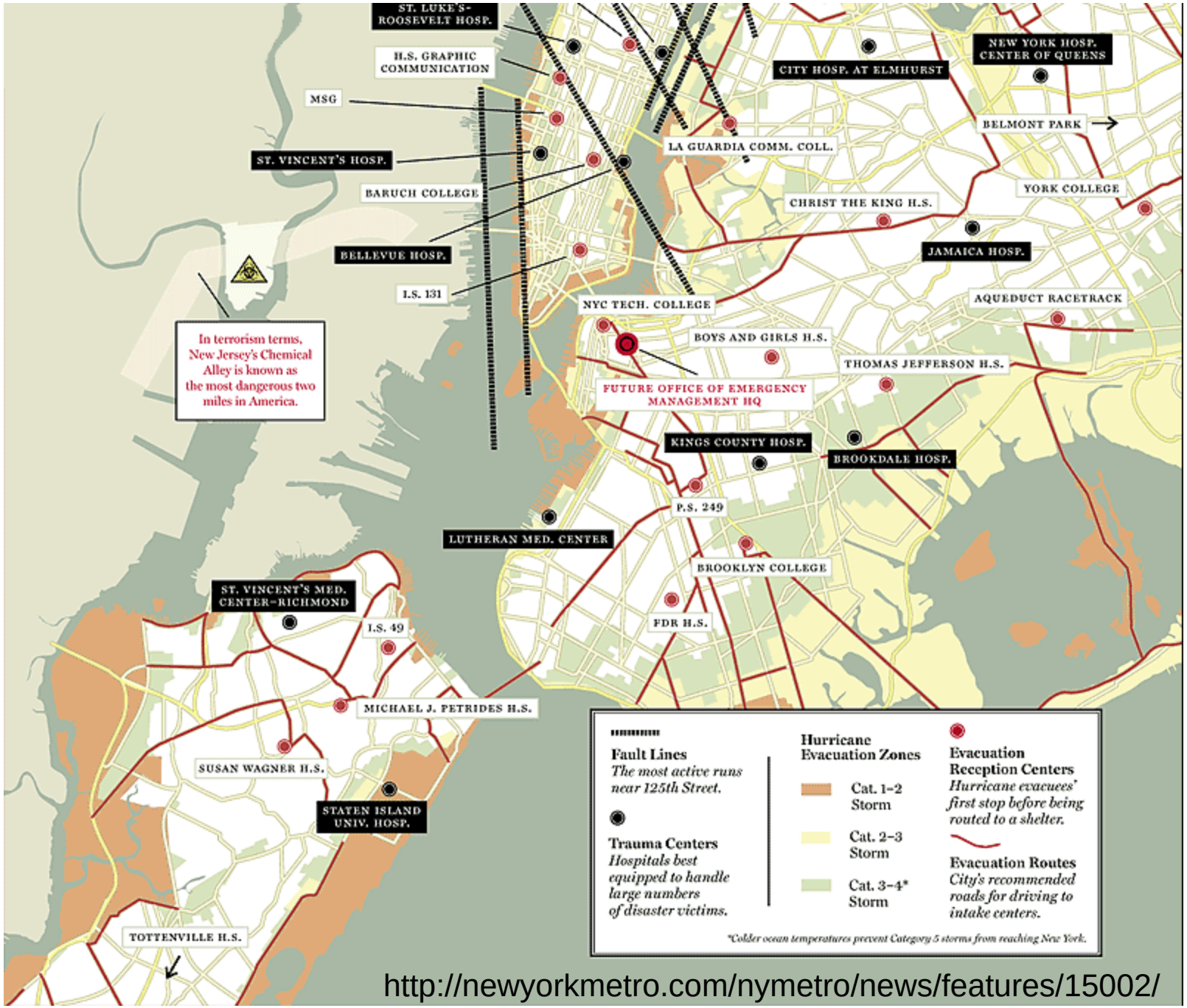
-1- STORM SURGE

-2- MARINE SAFETY

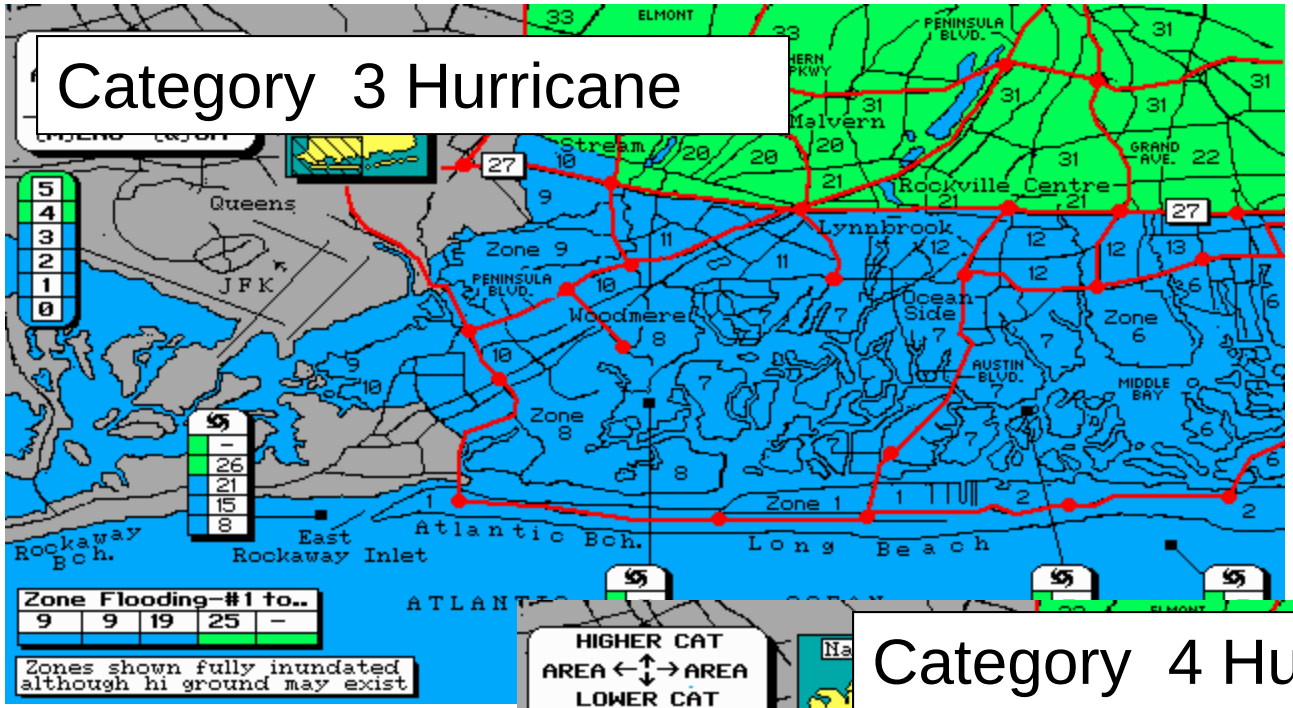
-3- HIGH WINDS

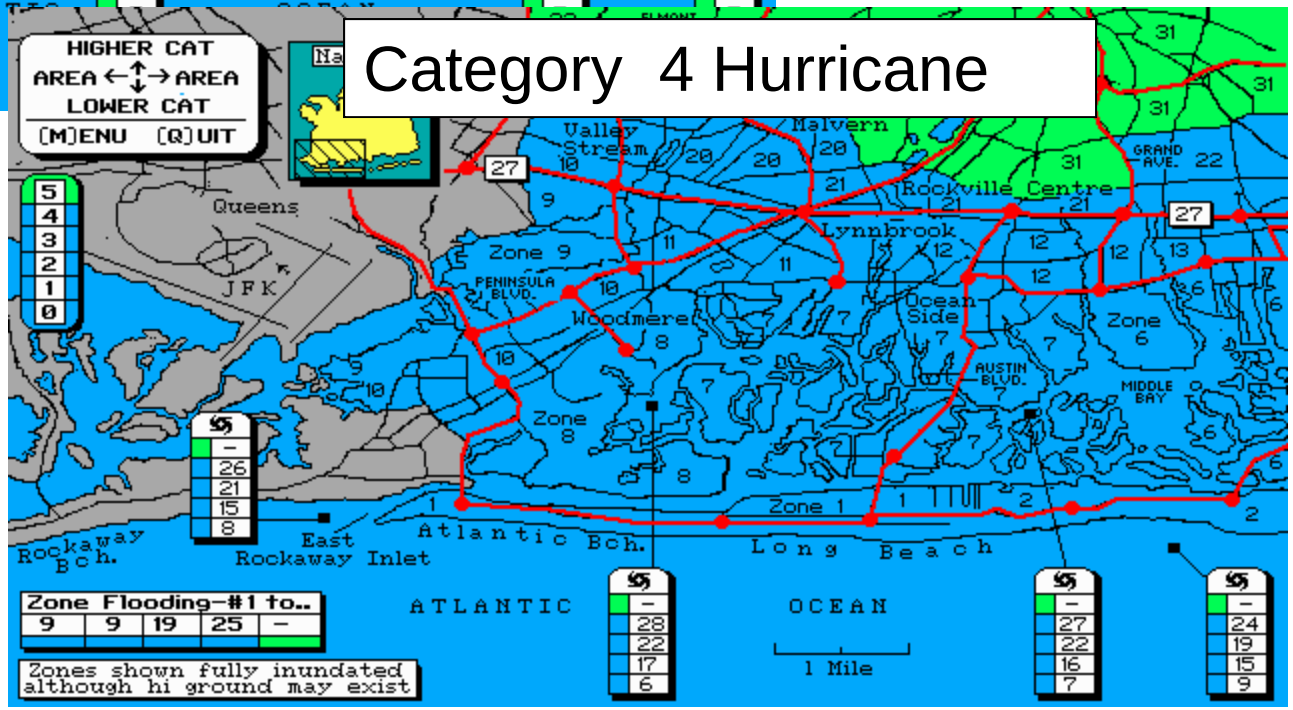
-4- TORNADOES

-5- INLAND FLOODING

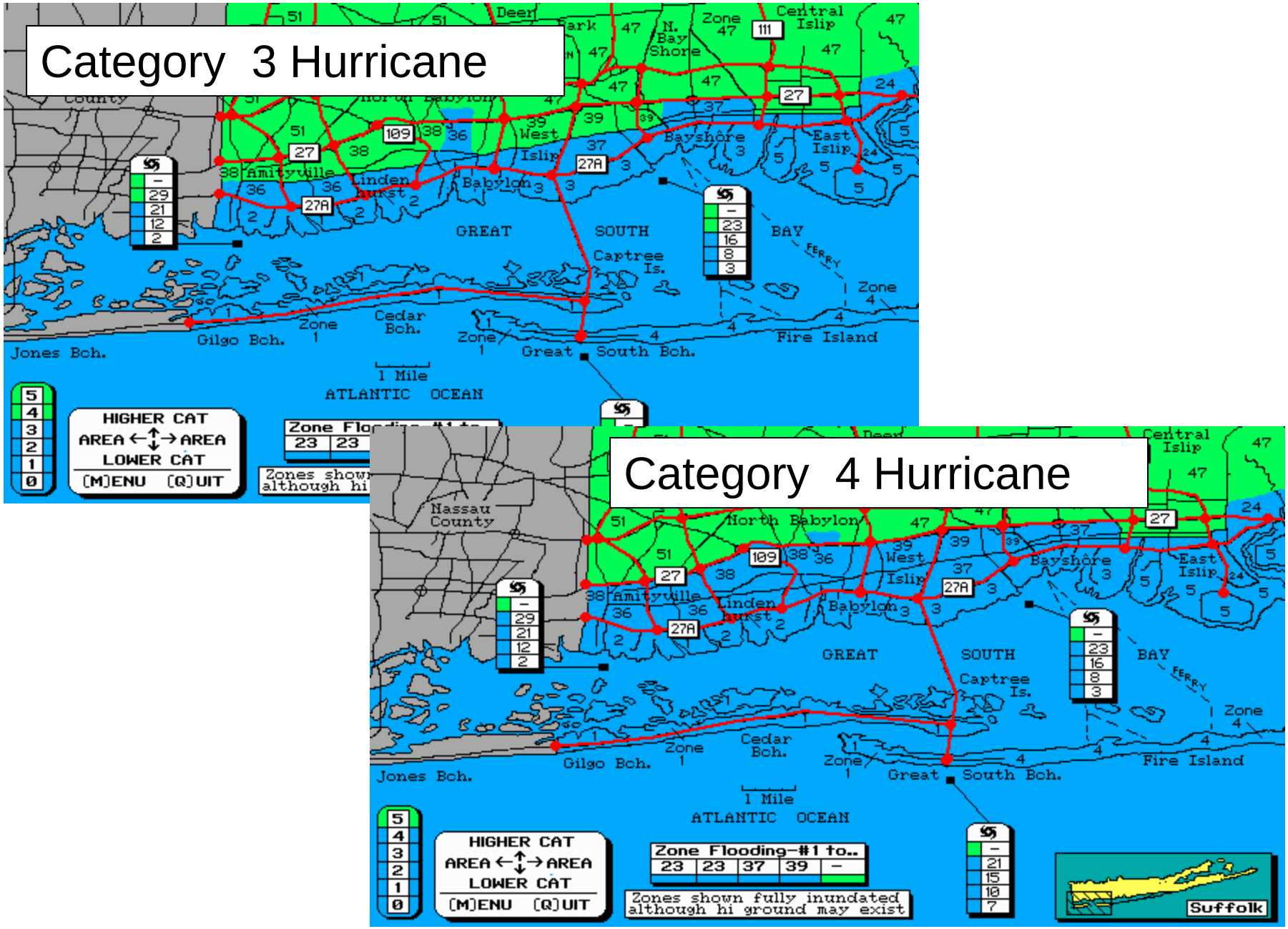


http://newyorkmetro.com/nymetro/news/features/15002/

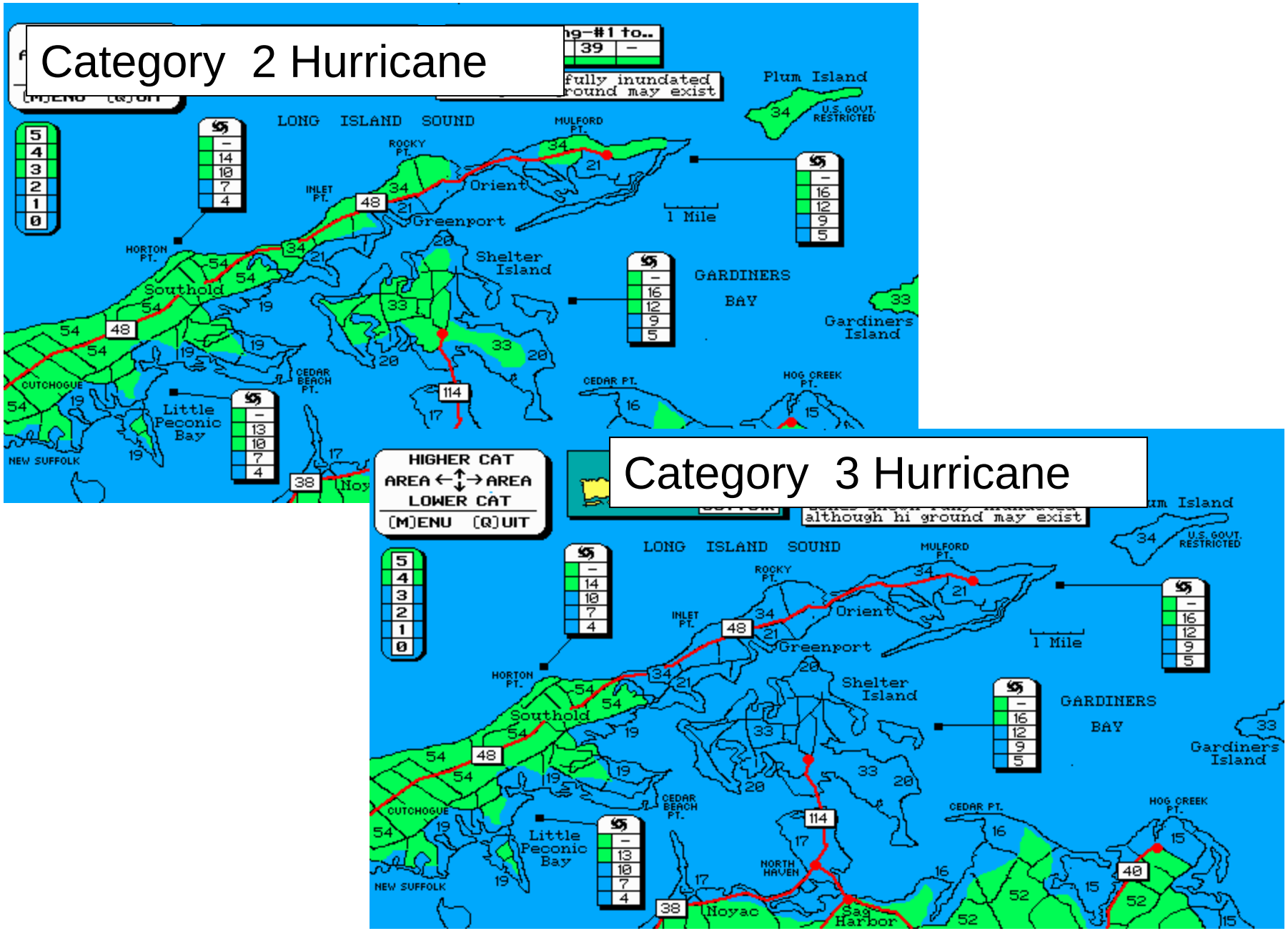




http://www2.sunysuffolk.edu/mandias/38hurricane/storm_surge_maps.html

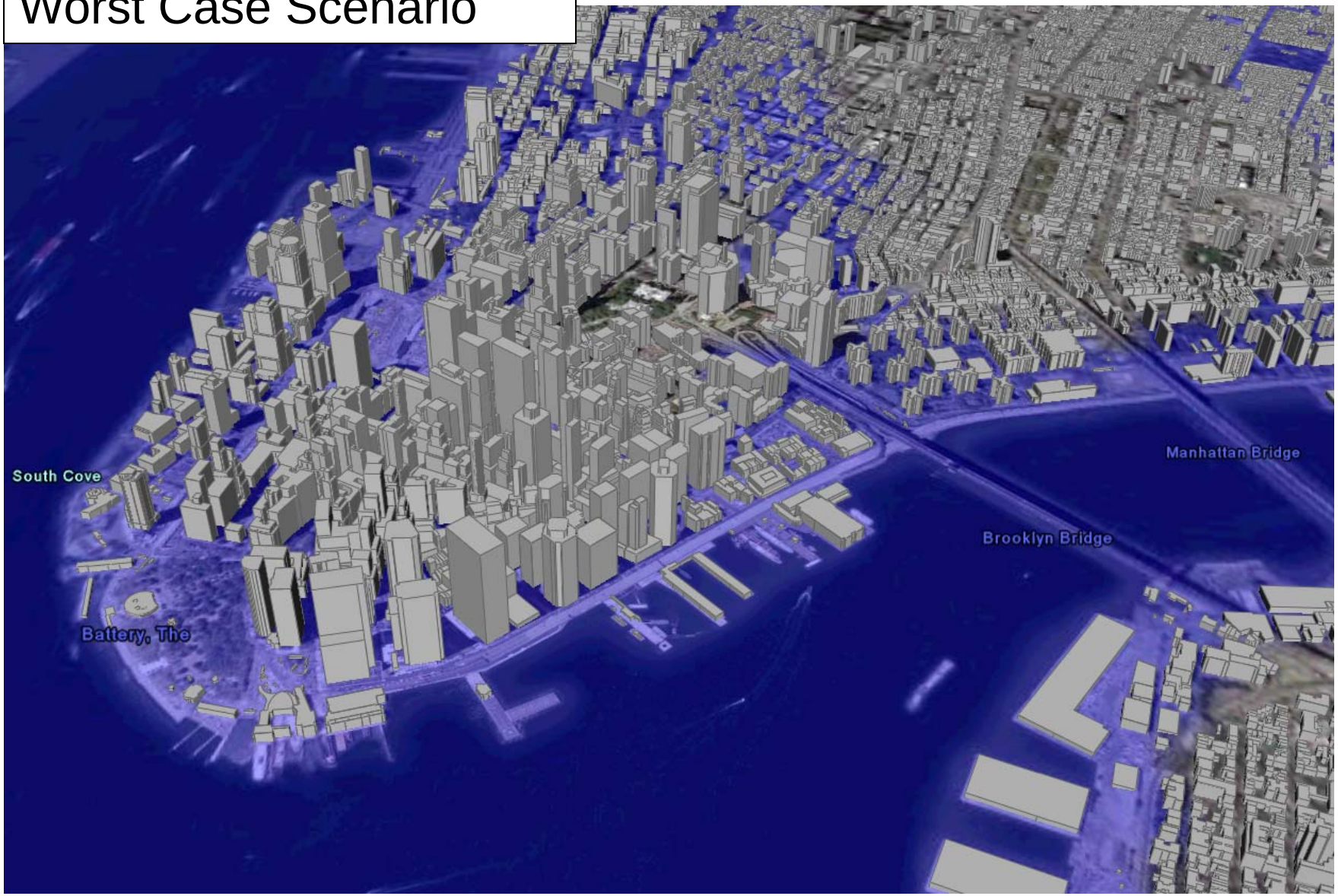


http://www2.sunysuffolk.edu/mandias/38hurricane/storm_surge_maps.html

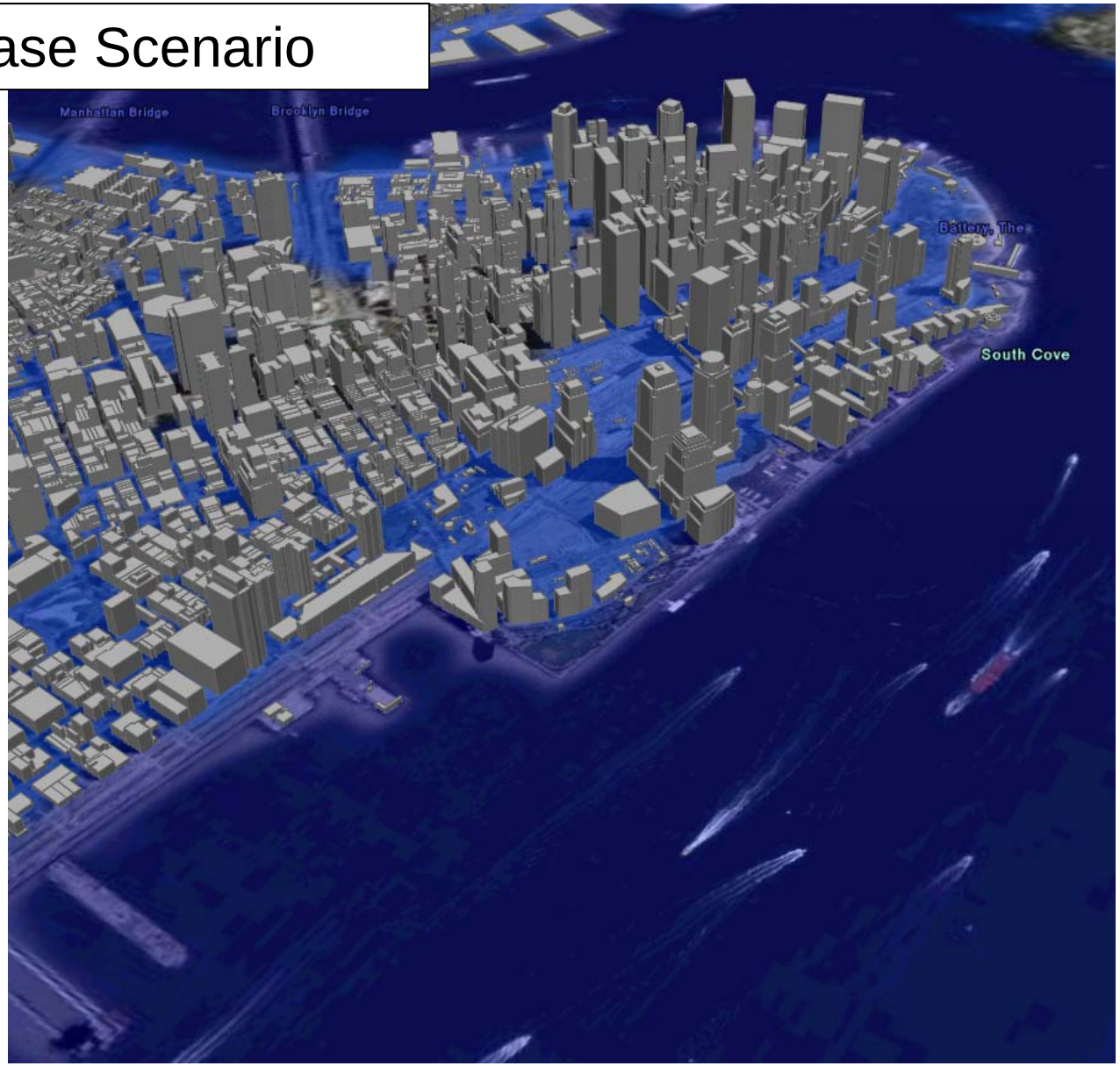


http://www2.sunysuffolk.edu/mandias/38hurricane/storm_surge_maps.html

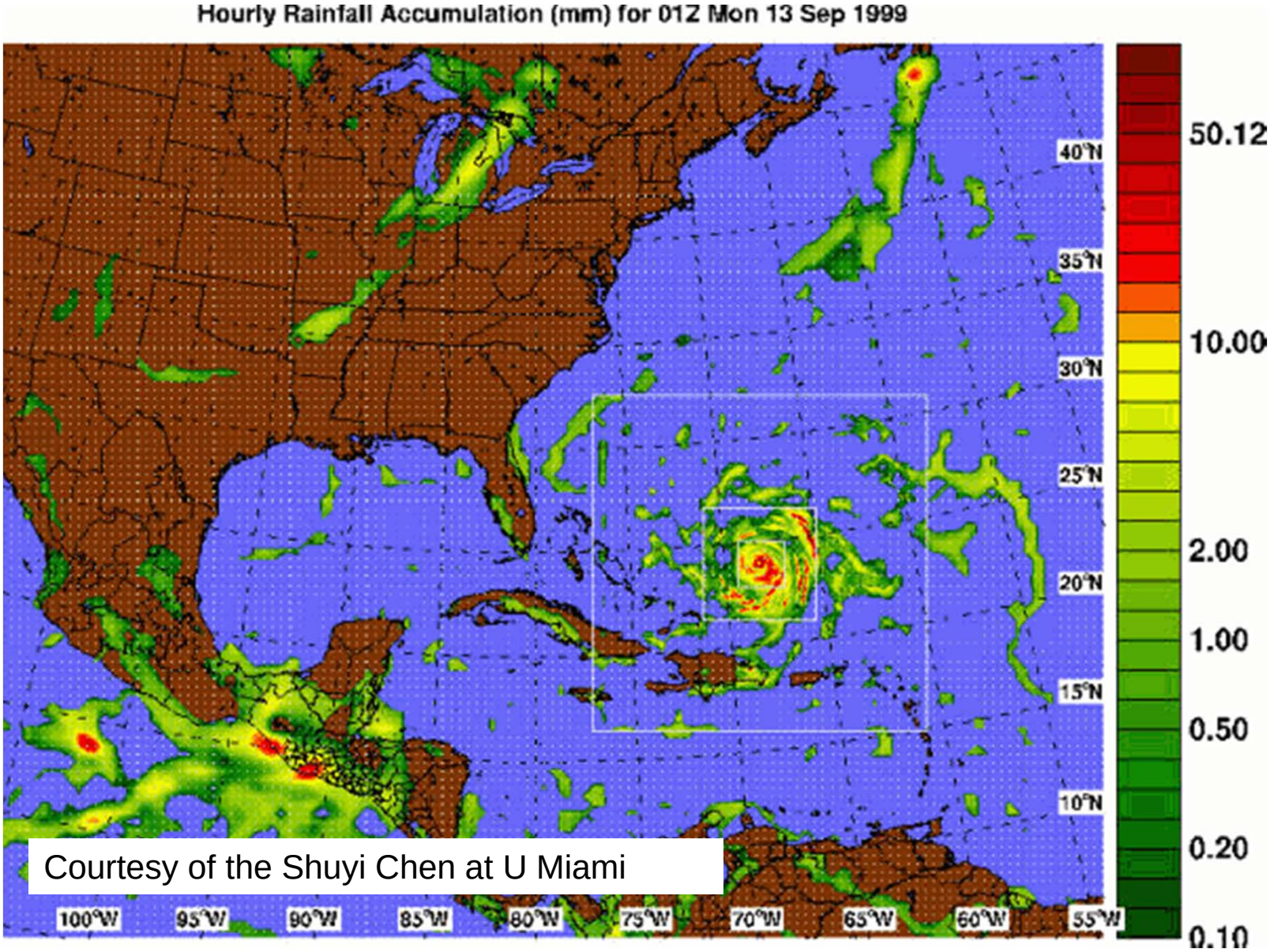
Worst Case Scenario



Worst Case Scenario



Vortex-following (double nest) MM5 Run



Courtesy of the Shuyi Chen at U Miami

Floyd animation of 4-km moveable nest