

ESCI 1010 Lab 7

Hurricanes (AKA: Typhoons, Cyclones)

Before Lab: Review pages 328-361 in your Weather and Climate textbook. Please pay special attention to the sections entitled: "Hurricanes around the Globe: The Tropical Setting", "Hurricane Characteristics", "Hurricane Structure", and "Hurricane Movement and Dissipation". You may also elect to consult the National Hurricane Center through their website: www.nhc.noaa.gov where you can find information on particular storms, specific weather observations and imagery as well as forecasts and advisories.

Summary: This lab focuses on tropical systems. This lab exercise supports building your understanding of the tropical systems including: ingredients for formation, development, and impacts.

LAB EXERCISE

1. Hurricane Season for the Atlantic Ocean Basin begins on June 1 and ends on November 30. Given that evaporation provides fuel for tropical systems, how does this fuel source help you make sense of when storms form and where (see Figure 7-1) they form? (Consult Figure 12-2 in your textbook).

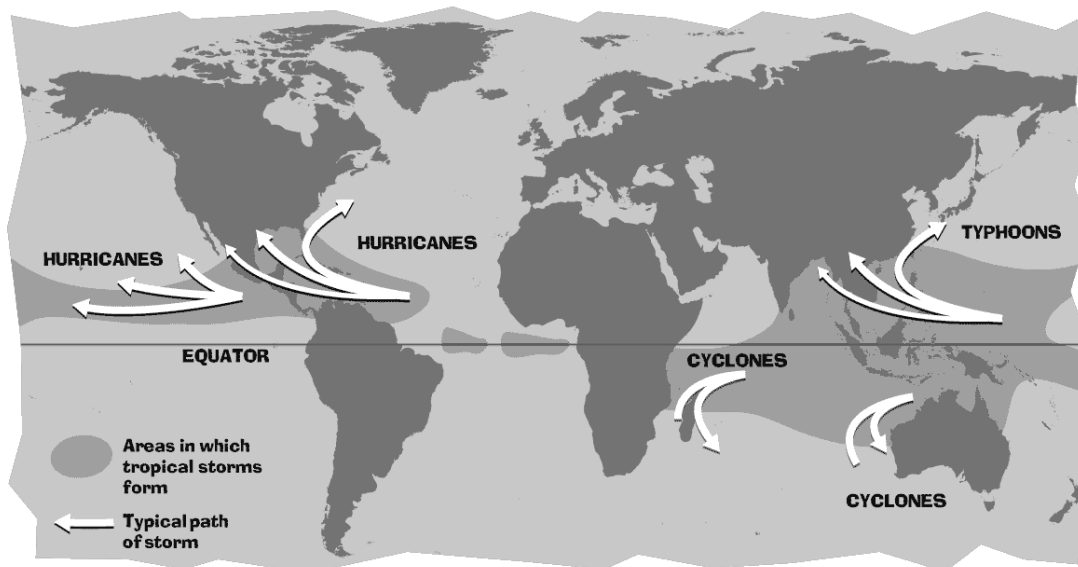
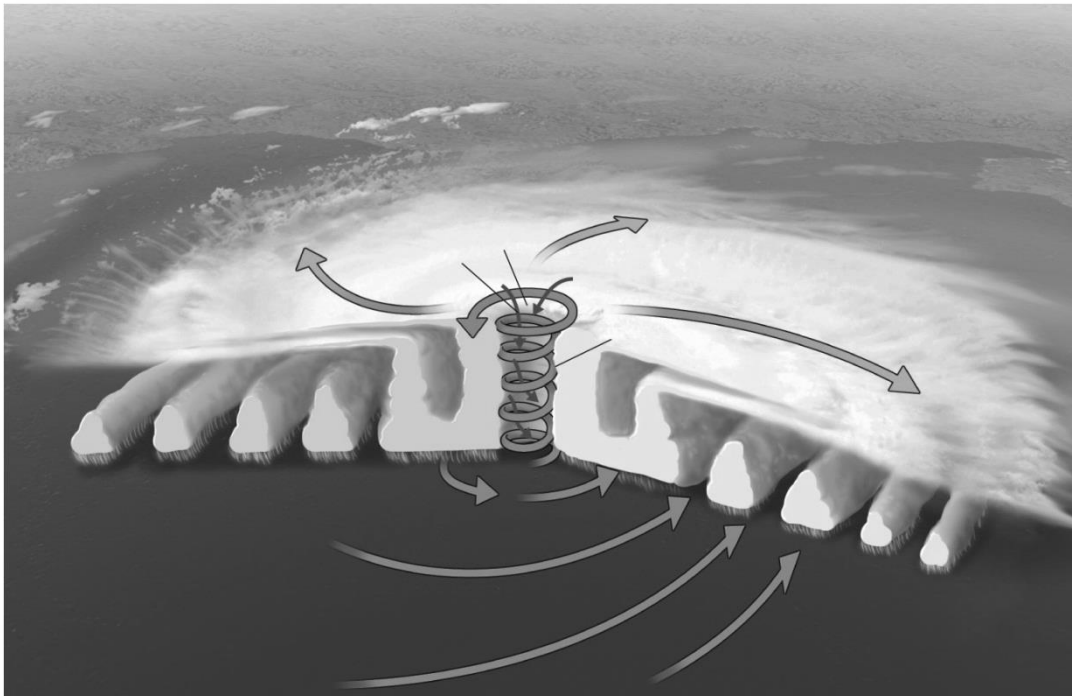


Figure 7-1: Tropical Storm Source Regions (source: NASA.gov)

2. Hurricanes are low pressure systems that form above tropical waters. On the cross-section of a hurricane depicted below (Figure 7-2) label the following:

- a. Eye
- b. Eye wall
- c. Rainband
- d. Descending air
- e. Rising air
- f. Convergence
- g. Divergence



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Figure 7-2: Structure of a Hurricane.

3. Atmospheric pressure varies within the storm and also over the course of the storm’s life-cycle. Some of the lowest air pressures observed have been associated with very strong tropical systems. As tropical storms intensify their central pressure decreases. Table 7-1 summarizes pressure observations for Hurricane Manuel (2013).

- a. What day was Hurricane Manuel the most intense (strongest): _____.
- b. What day did Hurricane Manuel begin to weaken: _____.

Date	Minimum Central Pressure
SEP 13 2013	999 MB
SEP 14 2013	996 MB
SEP 15 2013	985 MB
SEP 16 2013	1002 MB
SEP 17 2013	1004 MB
SEP 18 2013	1000 MB

4. 2013 has been a quiet hurricane season for the Atlantic – but has been more active for the Pacific. Using the data in Table 7-2 plot the path of the tropical storms on the map provided (Figure 7-3).

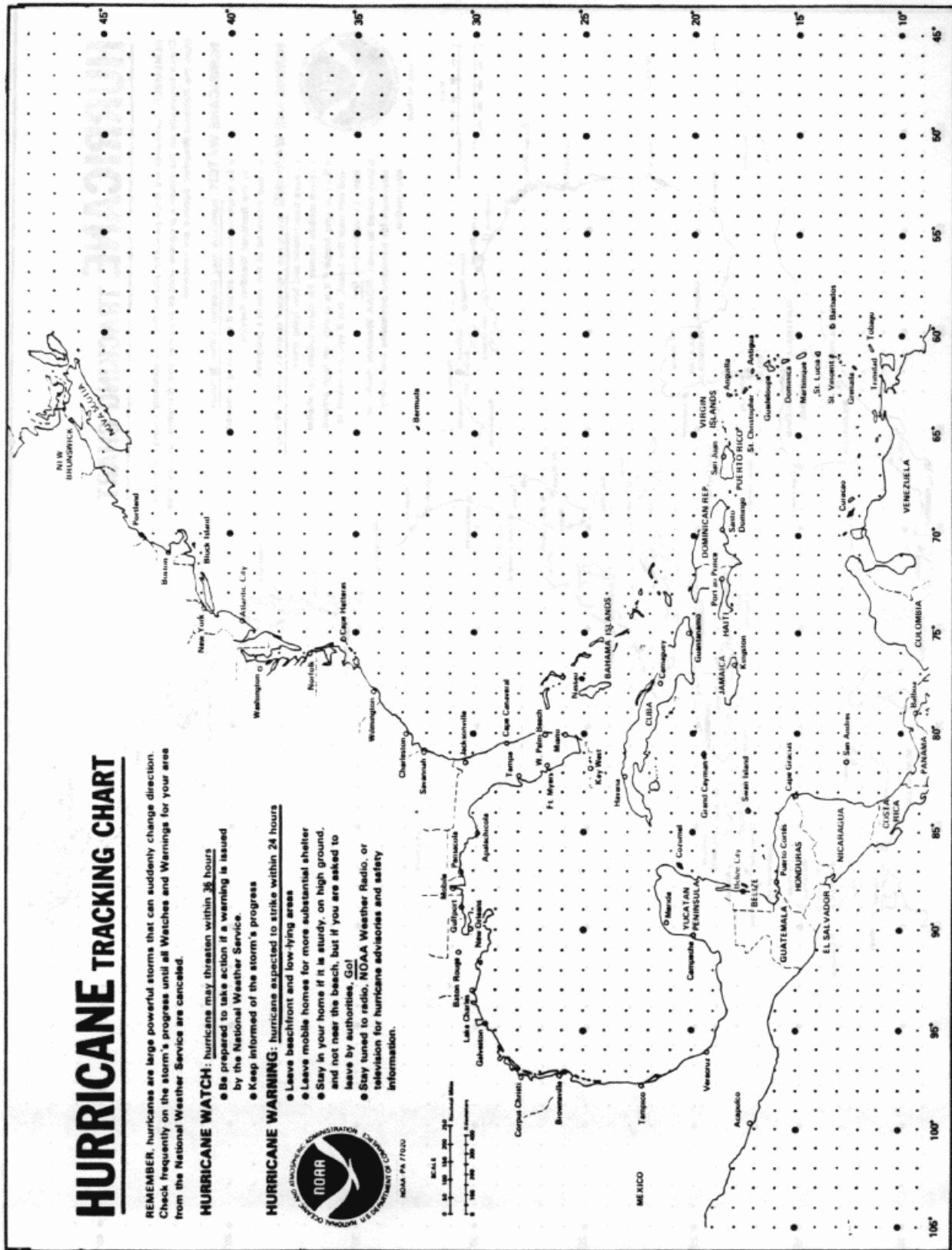
Location	Date	Storm
25.5N 86.5W	JUN 5 2013	Tropical Storm Andrea
27.7N 85.1W	JUN 6 2013	Tropical Storm Andrea
33.4N 80.2W	JUN 7 2013	Tropical Storm Andrea
40.9N 72.5W	JUN 8 2013	Tropical Storm Andrea
19.7N 93.7W	SEP 12 2013	Hurricane Ingrid
19.5N 95.0W	SEP 13 2013	Hurricane Ingrid
20.3N 94.5W	SEP 14 2013	Hurricane Ingrid
22.5N 95.6W	SEP 15 2013	Hurricane Ingrid
23.8N 97.8W	SEP 16 2013	Hurricane Ingrid
23.7N 99.9W	SEP 17 2013	Hurricane Ingrid
22.0N 87.6W	OCT 3 2013	Tropical Storm Karen
25.2N 90.0W	OCT 4 2013	Tropical Storm Karen
27.5N 91.5W	OCT 5 2013	Tropical Storm Karen
28.1N 89.9W	OCT 6 2013	Tropical Storm Karen

Source: National Hurricane Center (www.nhc.noaa.gov)

5. As a hurricane makes landfall often reference is made to the “strong” or “weak” side of the storm. Using Hurricane Andrew (1992) as an example let’s consider how the forward motion of the storm and the surface winds interact with each other to generate a “strong” and “weak” side of the system.
- Draw the surface winds as they rotate around the hurricane (Hint: recall Andrew is a Low Pressure system).
 - Assuming Hurricane Andrew was moving directly from EAST to WEST, use an arrow to depict the forward motion of the storm.
 - Identify (with an “*”) the side of the storm where you would expect to find the strongest wind-speeds.



Figure 7-3 Hurricane Tracking Map.



6. Tropical systems generate a series of impacts including strong winds, heavy rains, large waves, tornadoes, and storm surge. Storm surge is a rise in water level generated by a tropical system above normal tide levels. Wind and low pressure contribute to this storm surge (see Figure 7-4).

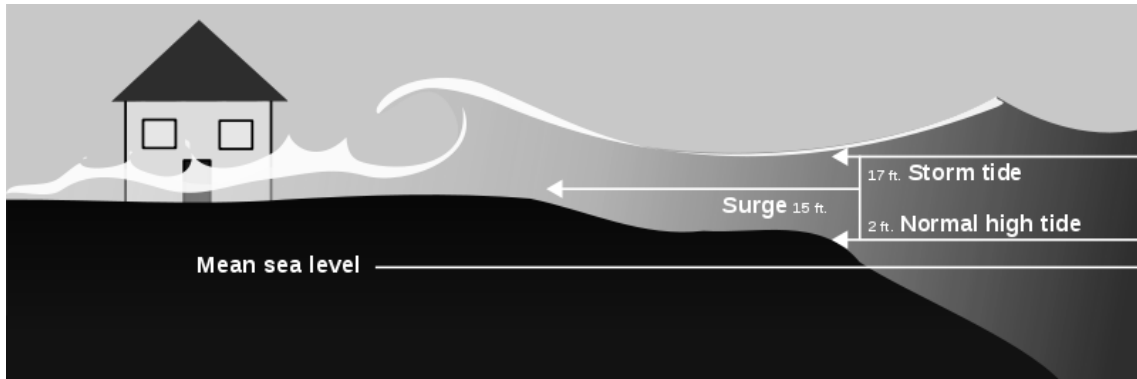


Figure 7-4: Storm Surge (Source: noaa.gov).

Superstorm Sandy (2013) provides an example of dramatic storm surge (see Figure 7-5 for context). Based on the definition of storm surge discuss why timing of landfall is a forecast element that residents, and community leaders/emergency managers are eager to understand.

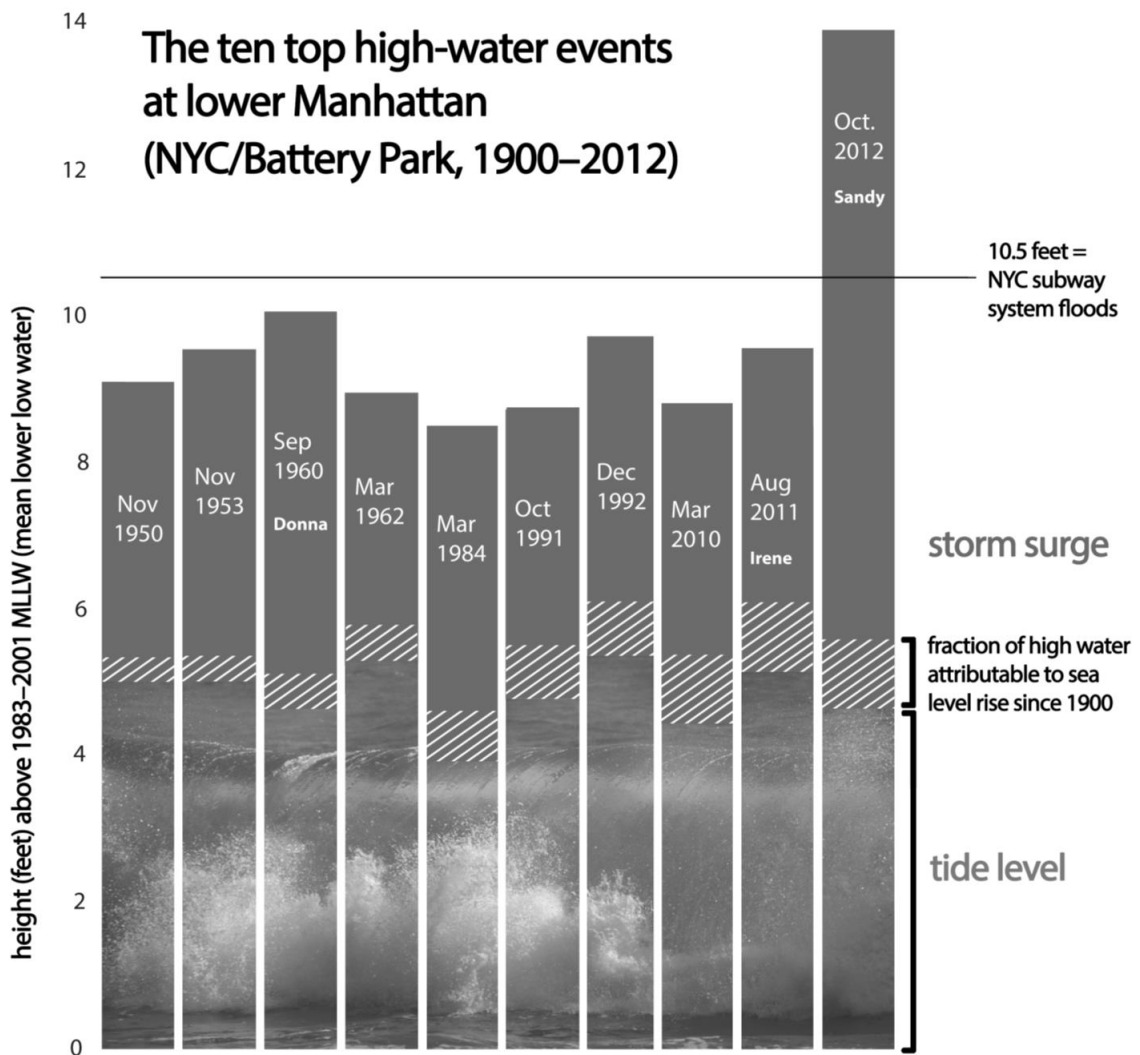


Figure 7-5: Superstorm/Hurricane Sandy storm surge in New York City (Source: ucar.edu).