Name: _____ Date: _____

PS 111 - Lab

Chasing Hurricane Andrew

Background

Hurricanes are the most destructive storms on earth. They develop from tropical storms (cyclones) and are Classified as hurricanes when their winds reach 64 knots (~ 71 mph or 119 kph). Hurricanes include a small central region known as the eye, where the winds are light and there are few clouds. Moving out from the eye, a narrow band of intense thunderstorms, heavy rains, and strong winds is encountered. This band is called the eye wall. Beyond the eye wall are strong but diminishing spirals of the same weather. Hurricanes are huge storms. Typically they are about 500 km in diameter, and they usually last for a week or more.

Hurricanes contain tremendous amount of energy. They gather this energy from warm ocean waters in the tropics. As the warm, humid air rises, it cools and condenses, releasing heat (called latent heat). This heat warms the surrounding air, making it lighter and causing it to rise farther. As the warm air rises, cooler air flows in to replace it, causing wind. This cooler air is warmed by the ocean, and the cycle continues. This heat from warm ocean water is the fuel that hurricanes run on. For this reason, hurricanes diminish and die when they move inland or move into colder waters.

In addition to the high winds – gusts up to *172 knots* (about 192 mph or 320 kph) – and the torrential rains, hurricanes produce what is known as a storm surge. The circular winds, together with the low-pressure eye and high-pressure outer regions of a hurricane, create a mound of water in the center of a hurricane. The storm surge causes considerable flooding and is responsible for most hurricane damage and deaths.

Weather satellites in orbit above the Earth can easily detect hurricanes. Satellite data, along with data from radar and aircraft, is used to follow developing hurricanes. Through tracking, we can tell where a hurricane has been. We also can estimate where it will go in the near future. When it appears that a hurricane is moving toward land, the National Weather Service (NSW) issues watches and

Objective

The objective of this activity is to track the position of Hurricane Andrew for a period of 6 days and to distinguish between a hurricane watch and a hurricane warning issued by the National Weather Services.

warnings. A hurricane watch means that hurricane conditions are likely in the watch area within 36 hours. A hurricane warning means that these conditions are likely within 24 hours. People living in low coastal areas that could be affected by a storm surge need to evacuate as soon as watches and warnings are issued.

In August 1992, Hurricane Andrew caused a tremendous amount of human suffering and billions of dollars of damage in the Bahamas, the Southern tip of Florida, and parts of Louisiana. This hurricane was unusual because it stuck the United States twice. After coming ashore in Florida, it passed over the Gulf of Mexico – regaining strength in the warm Gulf waters – then hit the coast of Louisiana. This activity contains the actual tracking data collected on Hurricane Andrew.

Procedure

1. Look at the data in the different parts of the table marked "Track of Hurricane Andrew." It contains three types of information:

a. ***Date/Time:*** Data was collected on Andrew every six hours beginning August 16 through August 28. Only a portion of the data is presented here. Time is given in the military convention; for example, 1200 is 12:00 noon, and 1800 is 6:00 pm.
b. ***Position:*** This is the position of the eye of the hurricane by latitude and longitude. It is important to remember that the storm is much bigger than the eye. The winds extend out beyond the eye about 100 km in all directions (about _ the area of one 5^{o} longitude-latitude square on the map).
c. ***Wind Speed:*** This is the maximum speed of the winds in the hurricane, not the speed with which the hurricane is actually moving. Wind speed is given in knots (kt). 1 kt = 1.15 mph = 1.85 kph.
2. Plot the data given in the tracking table on the map your teacher has supplied. Make a dot for each position of Andrew, and then connect the dots. For each position at the beginning of a day (time = 0000), draw a small star or asterisk over the dot. You will be asked to stop and plotting data periodically and issue hurricane warnings and watches based on the path of the hurricane you have plotted. REMEMBER: A ***hurricane warning*** means hurricane conditions are likely for a location within 24 hours. A ***hurricane watch*** means hurricane conditions are likely for a location within 36 hours.

Questions/Conclusions

1. Where did Andrew do the most damage before striking Florida?

2. Describe the motion of the storm displayed on your tracking map from the first point you plotted to the last.

3. What happens to the direction of Andrew after it struck Louisiana?

4. What happened to the wind speed in Andrew after it came aground in Louisiana? Why did this happen?

5. Judging from the wind speed, when did Andrew become a hurricane and when should it have been downgraded to a tropical storm?

6. In terms of damage done, why was it so devastating for Andrew to hit the southern part of Florida? Why might it have been less destructive it if had hit Farther north on the coast of the United States; for instance, Georgia or South Carolina?

Date/Time	Position Lat. (°N)	Lon. (°W)	Wind speed (knots)
Aug 21/0000	23.2	62.4	45
0600	23.9	63.4	45
1200	24.4	64.2	50
1800	24.8	64.9	50
Aug 22/0000	25.3	65.9	55
0600	25.6	67.0	60
1200	25.8	68.3	70
1800	25.7	69.7	80
Aug 23/0000	**25.6**	**71.1**	**90**

Stop! Question 1: Based on how far the storm has traveled over the last 24 hours and its direction so far, for which locations would you issue hurricane warnings and watches? You can tell how far the hurricane has traveled in the last 24 hours by looking at the distance between the last two stars or asterisks you have drawn on the map. Don't forget that the size of the hurricane is much larger than the dots you have drawn.

Date/Time	Position Lat. (°N)	Lon. (°W)	Wind speed (knots)
Aug 23/0600	25.5	72.5	105
1200	25.4	74.2	120
1800	25.4	75.8	135
Aug 24/0000	**25.4**	**77.5**	**125**

Stop! Question #2. Based how far the storm has traveled over the last 24 hours and its direction so far, which locations would you issue hurricane warnings and watches?

Date/Time	Position Lat. (°N)	Lon. (°W)	Wind speed (knots)
Aug 24/0600	25.4	79.3	120
1200	25.6	81.2	110
1800	25.8	83.1	115
Aug 25/0000	**26.2**	**85.0**	**115**

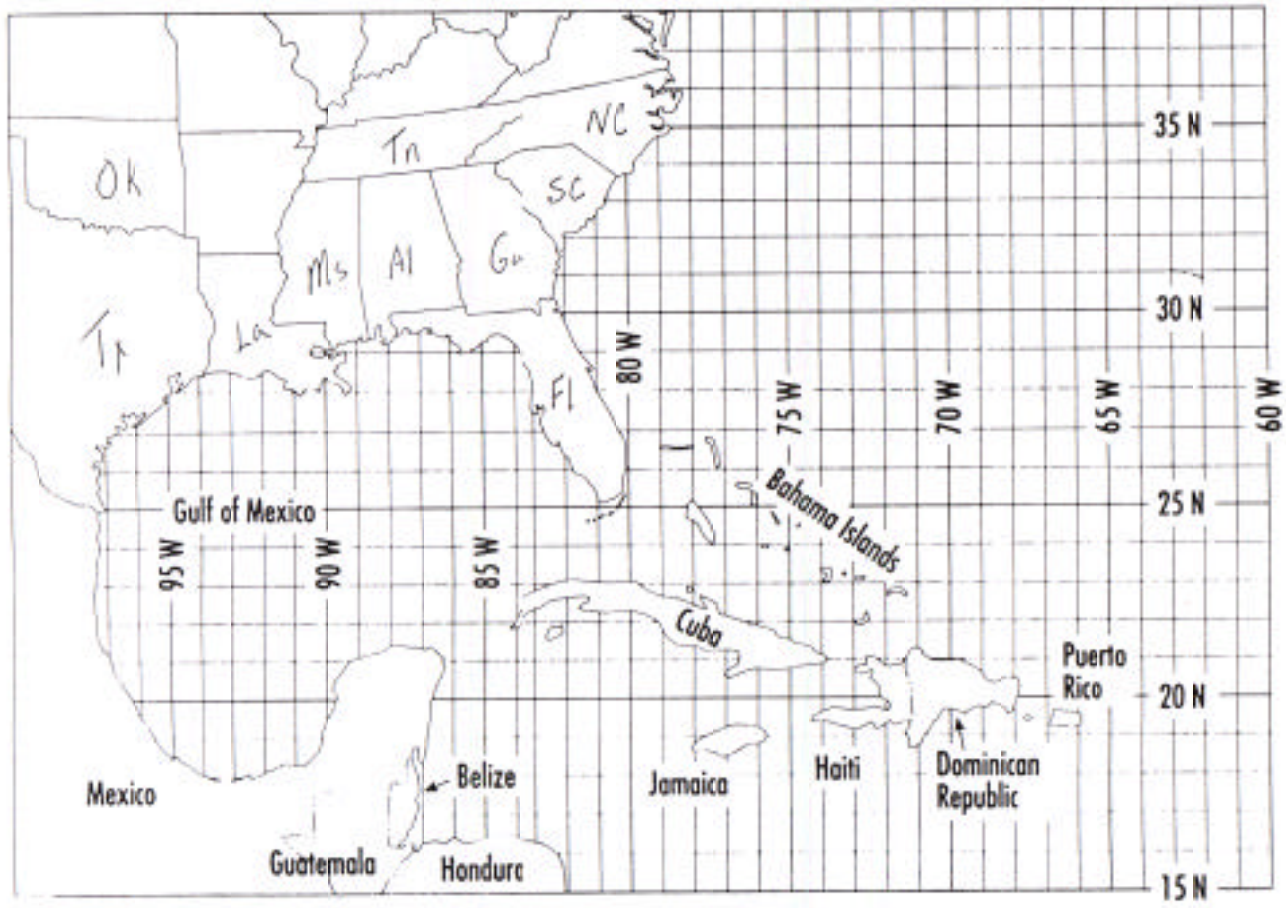
Stop! Question #3. Based how far the storm has traveled over the last 24 hours and its direction so far, which locations would you issue hurricane warnings and watches?

Date/Time	Position Lat. (°N)	Lon. (°W)	Wind speed (knots)
Aug 25/0600	26.6	86.7	115
1200	27.2	88.2	115
1800	27.8	89.6	120
Aug 26/0000	**28.5**	**90.5**	**120**

Stop! Question #4. Based how far the storm has traveled over the last 24 hours and its direction so far, which locations would you issue hurricane warnings and watches?

Date/Time	Position Lat. (°N)	Lon. (°W)	Wind speed (knots)
Aug 26/0600	29.2	91.3	115
1200	30.1	91.7	80
1800	30.9	91.6	50
Aug 27/0000	**31.5**	**91.1**	**35**

Stop! Question #5. Based how far the storm has traveled over the last 24 hours and its direction so far, which locations would you issue hurricane warnings and watches?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80 W
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95 W
90 W
85 W
Gulf of Mexico
Bahama Islands
Cuba
Puerto Rico
Mexico
Belize
Guatemala
Hondura
Jamaica
Haiti
Dominican Republic