PS : ES
Hurricane Tracking Lab

Name ________________

Period ______

Companion Websites: http://weather.unisys.com/hurricane/index.html
http://www.atwc.org
http://stevekluge.com/geoscience/regentses/labs/hurricane1.html

INTRODUCTION:

Hurricanes begin as ***tropical depressions*** (low pressure systems) just north of the equator west of Africa. As air that has gained heat and moisture from the ocean becomes ***warm and moist (mT)*** it rises up from the sea surface into the low pressure system, condensing water vapor releases heat that causes the air to rise even more. As surface air spirals in to fill the space left by the rising air, wind speeds around the low increase. When the wind speeds reach 35 knots*, the low becomes a tropical storm, and at 64 knots, a hurricane. (For more info, look up the Saffir-Simpson Scale at one of the companion websites).

The location and path of a hurricane is important to mariners and aviators when it is over water, and to people living on islands and coastlines in the hurricane's path.

Planetary winds are important in steering a hurricane in its westward trip across the Atlantic tropics toward the Caribbean Sea, the Gulf of Mexico, and the east coast of the United States.

In this lab, you'll plot the path of the hurricanes that occur during the current Atlantic hurricane season in an effort to learn where hurricanes get their energy, where they go, and why.

* A knot is 1 *nautical mile per hour*, abbreviated *nm/hr*. Nautical miles are used at sea and are equal to 1 minute of latitude (1/60th of a degree). A nautical mile is a little longer than the 5280' *statute mile* we use on land, so 1 knot is a little faster than 1 mile per hour.

TERMS TO KNOW:

The following terms are important for you to understand before you begin this lab. Use your textbook, the reference tables, an atlas, and/or any other resources you need to write definitions of the following terms:

PLANETARY WINDS ____

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AIR MASS ____

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The code letters describing air masses, and what they mean, and what that air is like:

mT ____

mP ____

cT ____

cP ____

AIR PRESSURE ____

____

MILLIBARS (mb) ____

____

Greenwich Mean Time (GMT) or ZULU or UNIVERSAL TIME: ______________________________

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(See http://stevekluge.com/geoscience/regentses/labs/zulutime.html.)

PROCEDURE

YOU'LL NEED:

- ❑ This lab
- ❑ Current hurricane data (get it at http://weather.unisys.com/hurricane/index.html)
- ❑ 2007 Hurricane Dean tracking data (appended to the end of this lab)
- ❑ 2007 Hurricane Tracking Chart and 2005 Hurricane Emily tracking chart
- ❑ Graph paper
- ❑ A sharp pencil

1. Using a pencil, plot the position of the first hurricane of the current tropical season on the 2007 Hurricane Tracking Chart. Ploy only one point for each day, though the data tables list several. Next to each plotted point, very lightly label the advisory number.

2. Connect the plotted points with a smooth line that approximates the path of the center of the storm and label that line with the name of the storm.

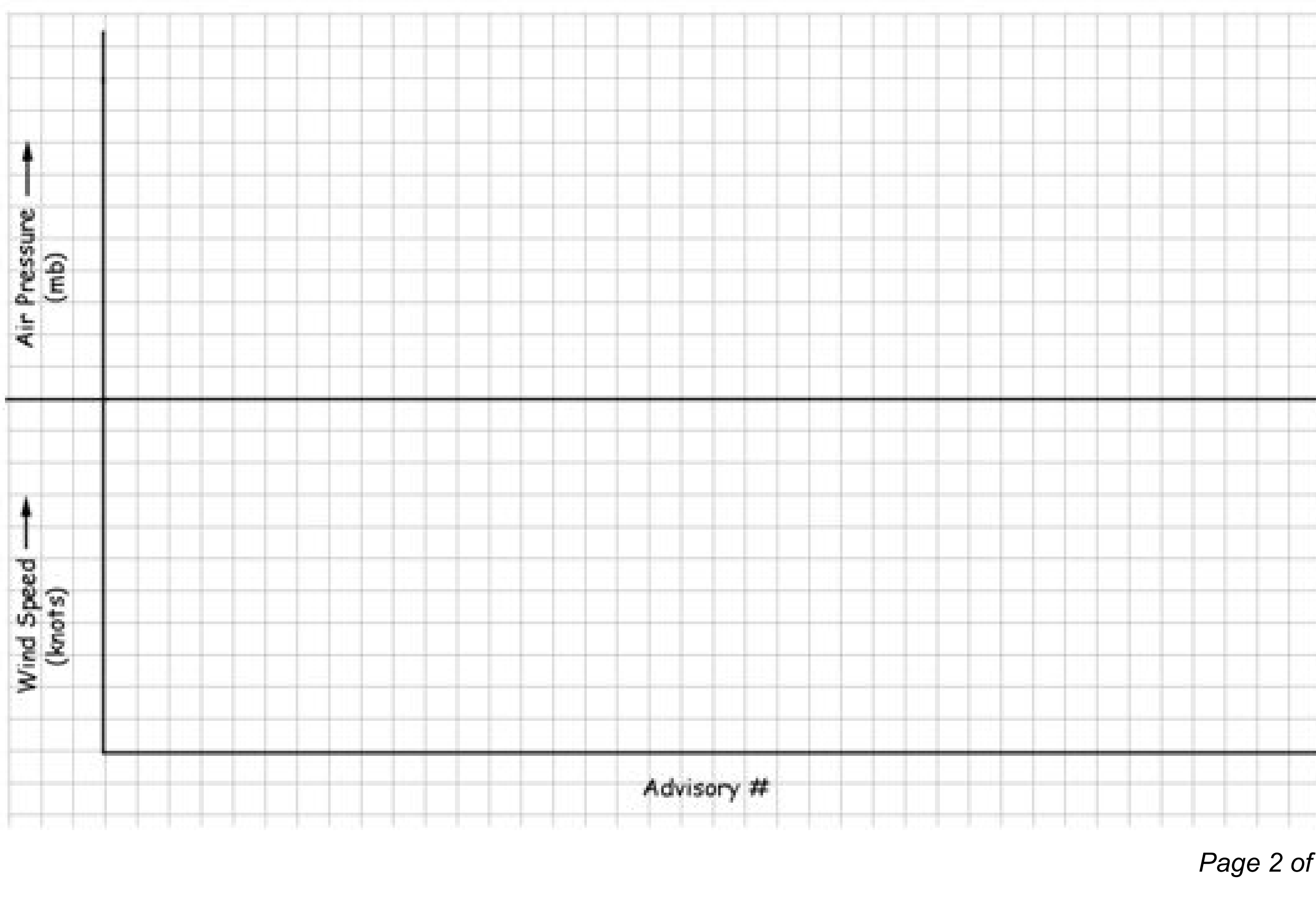
3. As the current Atlantic hurricane season progresses, do the same for all the hurricanes that occur. Get their daily positions at http://weather.unisys.com/hurricane/index.html

4. Using the data from hurricane Emily, a strong 2005 hurricane that hit the Yucatan peninsula of Mexico, answer/do the following:

   A-On the Hurricane Emily tracking chart, note that advisory 22 and advisory 37A are already plotted and labeled. Plot and label the advisories 24, 26, 28, 29A, 30, 32, 34, 35A, and 36 on the map, and connect them with a smooth line.

   B-Use the graph paper below or a spreadsheet to construct a line graph of wind speed and air pressure over time. Label the "Advisory #" on the X- axis (horizontal) of your graph. Label the bottom of the Y-axis "WIND SPEED", and the top of the Y- axis "AIR PRESSURE".

   Determine a reasonable scale on each axis to cover the values in the data table. For instance, the wind speeds range from 65 to 130 knots. Therefore your graph should probably start at 60 knots and go up to 140 knots, as shown above. Be sure to put a title on your graph. See the example below to get started:



C. Make a statement about the general relationship between air pressure and wind speed in the space below.

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D. Examine the data recorded while Emily was over land. What happened to the wind speed during that time?

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☆ E. Read the introduction to this lab again, and explain *WHY* EMILY'S winds slowed down while over land.

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F. What happened to the wind speed during 7/19 and 7/20?______________________*WHY?* _________________

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G. Notice the scale of nautical miles on your Emily map. Determine the average speed (in knots) of the storm system (not the wind's speed in the storm) between advisory 22 and advisory 26. *EXPLAIN* how you found that speed. (Speed or rate = distance/time)

SPEED =______________ How I figured it: ____

____

____

Show your work here:

H. What was the average speed in knots of Emily between advisory 30 and advisory 37A? ___________________

Show your work here:

5. The 2005 Hurricane season was a particularly active one, and studying the tracks of those storms can help us understand how hurricanes move. Study the chart from the 2005 hurricane season on the next page as you answer the following questions.

A. In what general compass direction do most hurricanes move initially?___________________________________

B. In what general compass direction are the hurricanes that end up in the North Atlantic moving as they die out? ____

C. At approximately what latitude do the hurricanes seem to turn from a southwesterly track to a northeasterly track? ____

☆ D. Refer to your reference table chart of the planetary winds. Is the change of direction of those storms compatible with the information on the chart?_____________ EXPLAIN!______________________________

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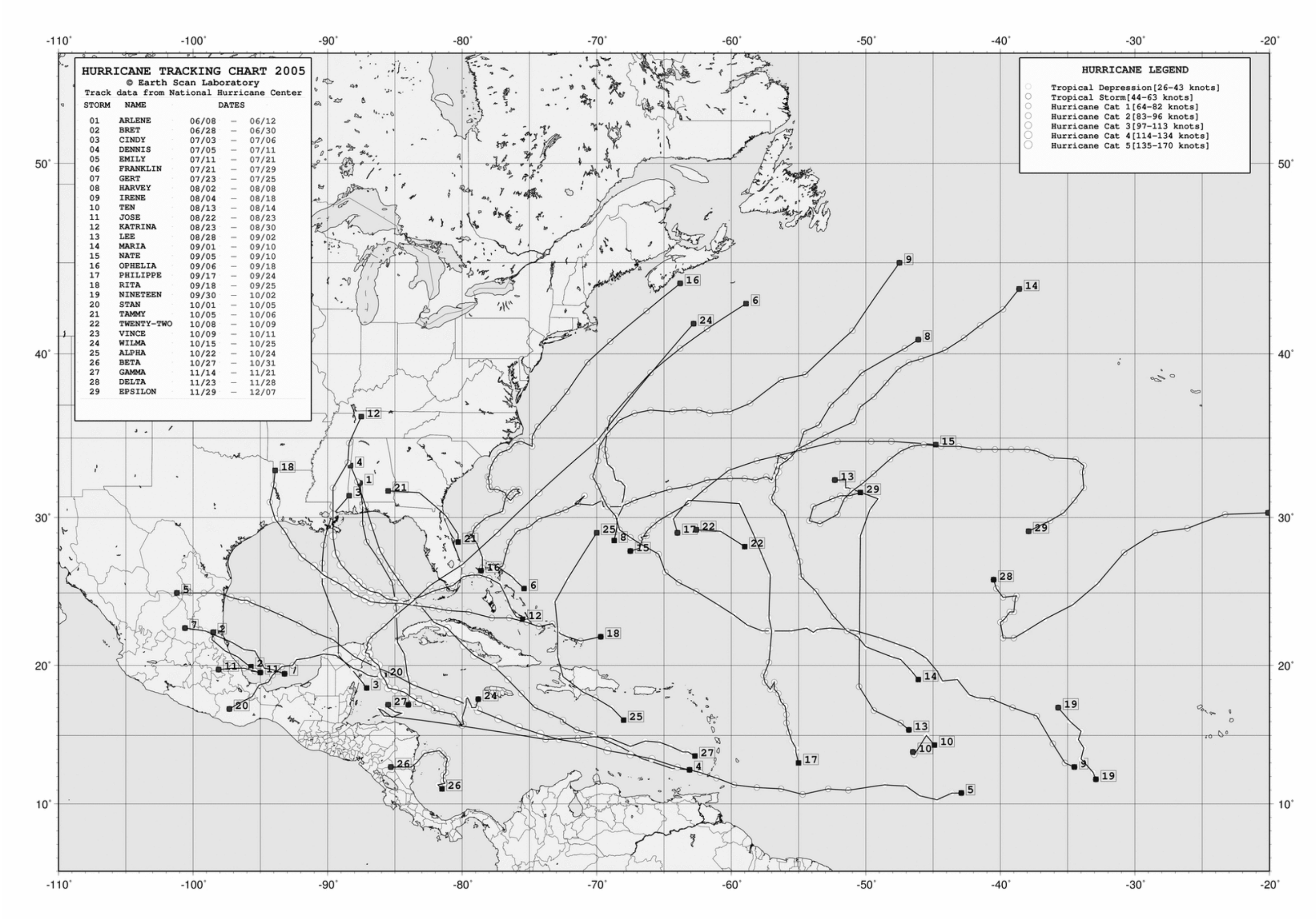
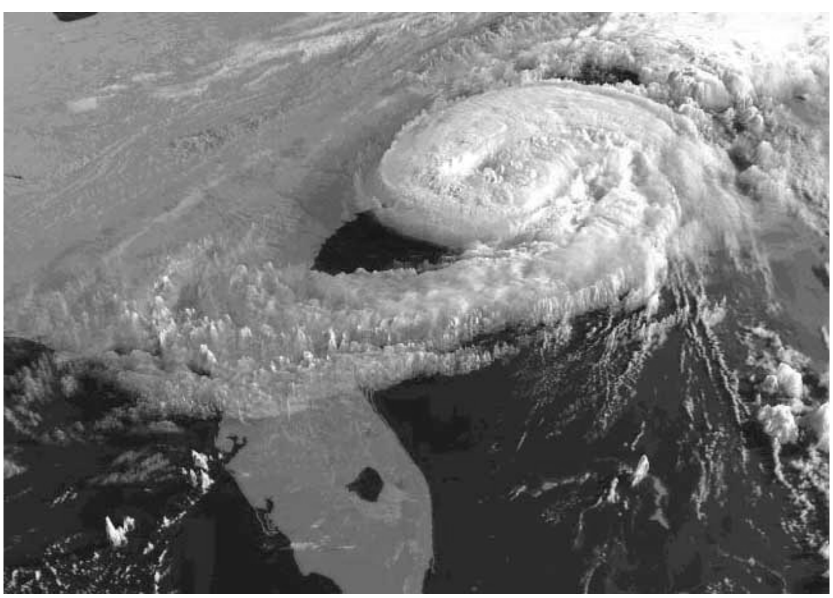


☆ 6. Study all the data tables you've used in this lab. From what you can tell, is warm, moist, and stormy air generally associated with ***high pressure*** or ***low pressure*** air? (circle one)

7. On the 2005 chart above, trace the path of several of the hurricanes with your finger. Do the paths generally ***go very straight*** or ***veer to the right*** or ***veer to the left*** ? (circle one)



8. Hurricane Bonnie ripped up the east coast of the United States in late August, 1998, when this image was made.

Describe in as much detail as you can the motion of the atmosphere around the center of the storm, as indicated by the clouds in the image.

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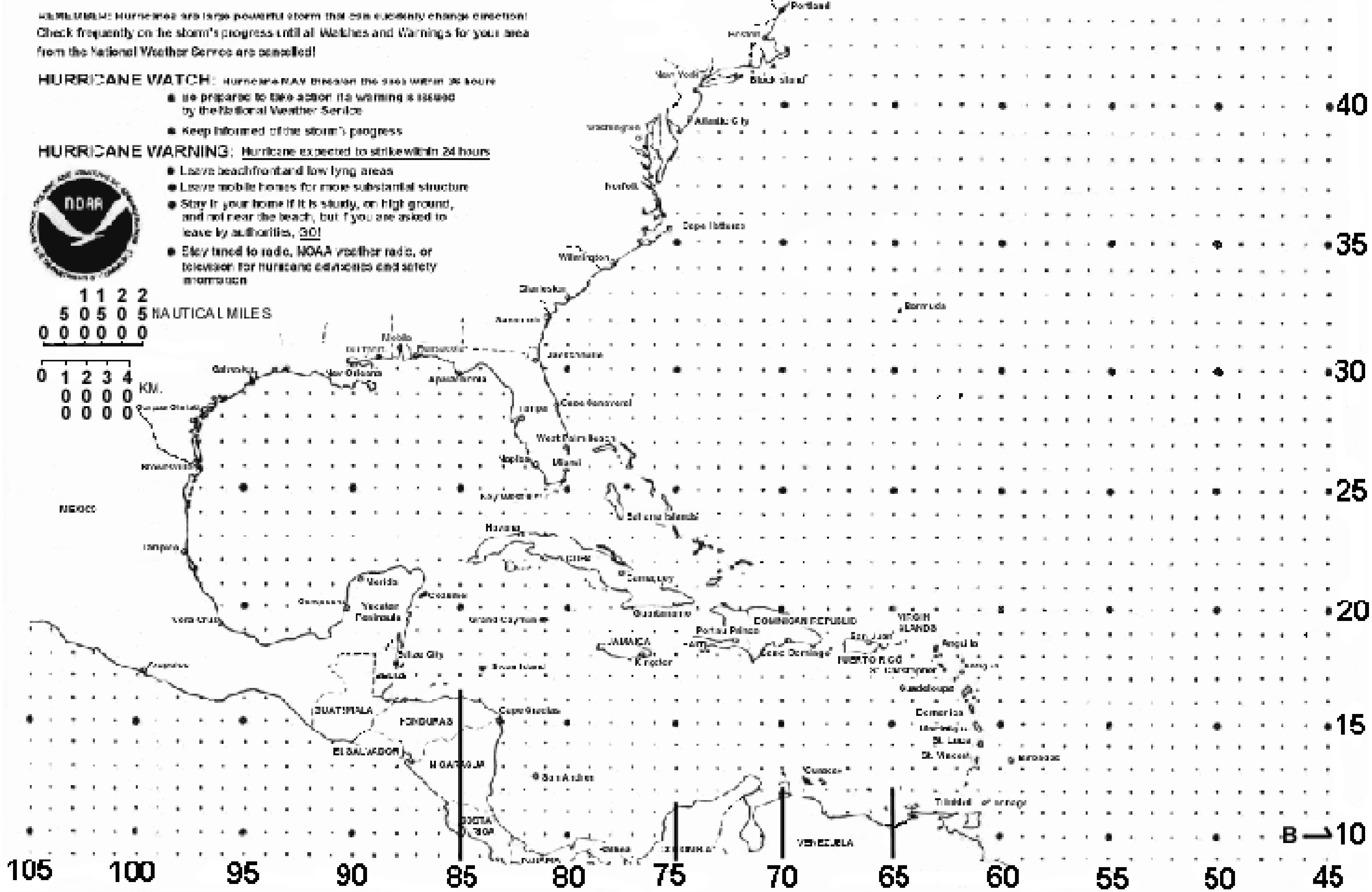
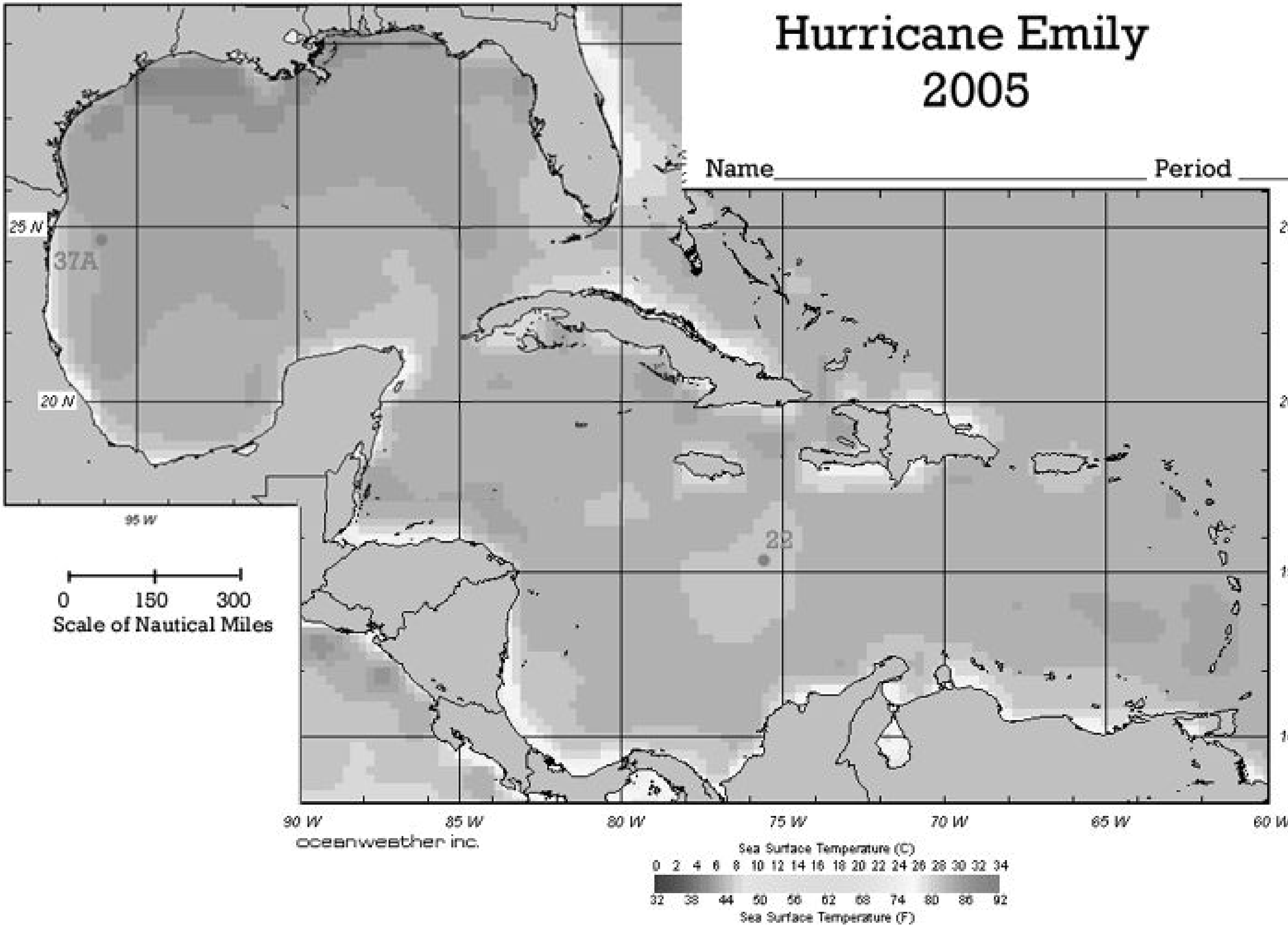
HURRICANE TRACKING CHART



Hurricane Emily 2005

Name______________________________ Period _____



Emily Data for questions 4A through 4H

22	15.6	-75.8	07/16/09Z	120	950	HURRICANE-4
22A	**15.9**	**-76.5**	**07/16/12Z**	**120**	**947**	**HURRICANE-4**
23	16.2	-77.3	07/16/15Z	125	943	HURRICANE-4
23A	16.4	-78	07/16/18Z	135	937	HURRICANE-4
24	16.8	-78.8	07/16/21Z	135	937	HURRICANE-4
24A	**17.1**	**-79.5**	**07/17/00Z**	**135**	**929**	**HURRICANE-4**
25	17.5	-80.3	07/17/03Z	135	930	HURRICANE-4
25A	17.7	-81.2	07/17/06Z	130	943	HURRICANE-4
26	18	-82	07/17/09Z	130	938	HURRICANE-4
26A	**18.3**	**-82.8**	**07/17/12Z**	**130**	**938**	**HURRICANE-4**
27	18.6	-83.6	07/17/15Z	130	946	HURRICANE-4
27A	19	-84.4	07/17/18Z	130	948	HURRICANE-4
28	19.4	-85.2	07/17/21Z	125	948	HURRICANE-4
28A	**19.6**	**-85.9**	**07/18/00Z**	**115**	**951**	**HURRICANE-4**
29	19.9	-86.5	07/18/03Z	115	955	HURRICANE-4
29A	20.3	-87.3	07/18/06Z	115	955	HURRICANE-4
30	20.6	-88	07/18/09Z	95	962	HURRICANE-2
30A	**21.2**	**-88.9**	**07/18/12Z**	**85**	**975**	**HURRICANE-2**
31	21.8	-89.6	07/18/15Z	85	975	HURRICANE-2
31A	22	-90.3	07/18/18Z	65	984	HURRICANE-1
32	22.3	-91	07/18/21Z	65	983	HURRICANE-1
32A	**22.6**	**-91.5**	**07/19/00Z**	**65**	**982**	**HURRICANE-1**
33	22.9	-92.1	07/19/03Z	80	983	HURRICANE-1
33A	23.2	-92.9	07/19/06Z	80	984	HURRICANE-1
34	23.5	-93.5	07/19/09Z	80	980	HURRICANE-1
34A	**23.7**	**-94**	**07/19/12Z**	**80**	**977**	**HURRICANE-1**
35	23.9	-94.5	07/19/15Z	80	972	HURRICANE-1
35A	24	-94.8	07/19/15Z	80	970	HURRICANE-1
35B	24.1	-95.2	07/19/19Z	85	959	HURRICANE-2
36	24.3	-95.6	07/19/21Z	85	956	HURRICANE-2
37	24.5	-96	07/19/23Z	110	945	HURRICANE-3
37A	**24.4**	**-96.1**	**07/20/00Z**	**110**	**948**	**HURRICANE-3**