

**LEARNING EXPERIENCE 1
STUDENT HANDOUT**

HURRICANES

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WEATHER-TRACKER TEAM: JOB REQUEST

TO: GROUP 1
FROM: REBECCA LONO
SUBJECT: POTENTIAL HURRICANE, INVESTIGATION IS REQUIRED

A tropical disturbance has formed off the western coast of Africa. Our satellites indicate that the system is moving to the northwest. We have assigned your class to track this storm in order to determine whether it will present a threat to the southeastern United States.

I have assigned your group to research background information on Atlantic hurricanes. Please consult **National Oceanic and Atmospheric Administration (NOAA) Atlantic Tropical Storm and Hurricane Occurrence, 2000-2003 (Table 1)** in order to give us an understanding of what time of the year hurricanes are most likely to occur in this part of the world. Data have been provided by the National Hurricane Center. They summarize all hurricanes that have entered the region in the past 4 years. I would like to see the following items from your group:

- 1) Use the NOAA data table (**Table 1**) to fill in the summary charts (**Tables 1A, 1B, and 1C**). Example tables are shown on the worksheet. You may use the template provided on the worksheet or make your own tables on an overhead transparency for your presentation.
- 2) Plot your data on the correct histogram. Titles of the histograms are: **Storm Occurrence Histogram** and **Storm Duration Histogram**. Templates for constructing the histograms are also provided on the worksheet.
- 3) Provide a paragraph summarizing when hurricanes are most likely to occur; how long the average hurricane lasts; the longest hurricane that has occurred in the past 4 years; and the average number of hurricanes that occur each year.

Prepare your data to present to the rest of the class. Keep your presentation under 5 minutes.

Becky Lono

Rebecca Lono
Managing Director, Miami
National Hurricane Center

Table 1. NOAA Atlantic Tropical Storm and Hurricane Occurrence, 2000-2003

index #	year	name	type	begin date	end date	# of days
1	2003	ana	tropical storm	20-Apr	24-Apr	5
2	2003	bill	tropical storm	29-Jun	2-Jul	4
3	2003	claudette	hurricane	8-Jul	17-Jul	10
4	2003	danny	hurricane	16-Jul	21-Jul	6
5	2003	erika	hurricane	14-Aug	17-Aug	4
6	2003	fabian	hurricane	27-Aug	8-Sep	13
7	2003	grace	tropical storm	30-Aug	2-Sep	4
8	2003	henri	tropical storm	3-Sep	8-Sep	6
9	2003	isabel	hurricane	6-Sep	19-Sep	14
10	2003	juan	hurricane	24-Sep	29-Sep	6
11	2003	kate	hurricane	25-Sep	7-Oct	13
12	2003	larry	tropical storm	1-Oct	6-Oct	6
13	2003	mindy	tropical storm	10-Oct	14-Oct	5
14	2003	nicholas	tropical storm	13-Oct	23-Oct	11
15	2003	odette	tropical storm	4-Dec	7-Dec	4
16	2003	peter	tropical storm	7-Dec	11-Dec	5
17	2002	arthur	tropical storm	14-Jul	16-Jul	3
18	2002	bertha	tropical storm	4-Aug	9-Aug	6
19	2002	cristobal	tropical storm	5-Aug	8-Aug	4
20	2002	dolly	tropical storm	29-Aug	4-Sep	7
21	2002	edouard	tropical storm	1-Sep	6-Sep	6
22	2002	fay	tropical storm	5-Sep	11-Sep	7
23	2002	gustav	hurricane	8-Sep	12-Sep	5
24	2002	hanna	tropical storm	12-Sep	15-Sep	4
25	2002	isidore	hurricane	14-Sep	27-Sep	14
26	2002	josephine	tropical storm	17-Sep	19-Sep	3
27	2002	kyle	hurricane	20-Sep	12-Oct	23
28	2002	lili	hurricane	21-Sep	4-Oct	14
29	2001	allison	tropical storm	5-Jun	17-Jun	13
30	2001	barry	tropical storm	2-Aug	7-Aug	6
31	2001	chantel	tropical storm	14-Aug	22-Aug	9
32	2001	dean	tropical storm	22-Aug	28-Aug	7
33	2001	erin	hurricane	1-Sep	15-Sep	15
34	2001	felix	hurricane	7-Sep	18-Sep	12
35	2001	gabrielle	hurricane	11-Sep	19-Sep	9
36	2001	humberto	hurricane	21-Sep	27-Sep	7
37	2001	iris	hurricane	4-Oct	8-Oct	5
38	2001	jerry	tropical storm	6-Oct	8-Oct	3
39	2001	karen	hurricane	12-Oct	15-Oct	4
40	2001	lorenzo	tropical storm	27-Oct	31-Oct	5
41	2001	michelle	hurricane	29-Oct	5-Nov	8
42	2001	noel	hurricane	4-Nov	6-Nov	3
43	2001	olga	hurricane	24-Nov	4-Dec	11
44	2000	alberto	hurricane	3-Aug	23-Aug	21
45	2000	beryl	tropical storm	13-Aug	15-Aug	3
46	2000	chris	tropical storm	17-Aug	19-Aug	3
47	2000	debby	hurricane	19-Aug	24-Aug	6
48	2000	ernesto	tropical storm	1-Sep	3-Sep	3
49	2000	florence	hurricane	10-Sep	17-Sep	8
50	2000	gordon	hurricane	14-Sep	18-Sep	5
51	2000	helene	tropical storm	15-Sep	25-Sep	11
52	2000	isaac	hurricane	21-Sep	1-Oct	11
53	2000	joyce	hurricane	25-Sep	2-Oct	8
54	2000	keith	hurricane	28-Sep	6-Oct	9
55	2000	leslie	tropical storm	4-Oct	7-Oct	4
56	2000	michael	hurricane	15-Oct	19-Oct	5
57	2000	nadine	tropical storm	19-Oct	21-Oct	3

Table 1A.

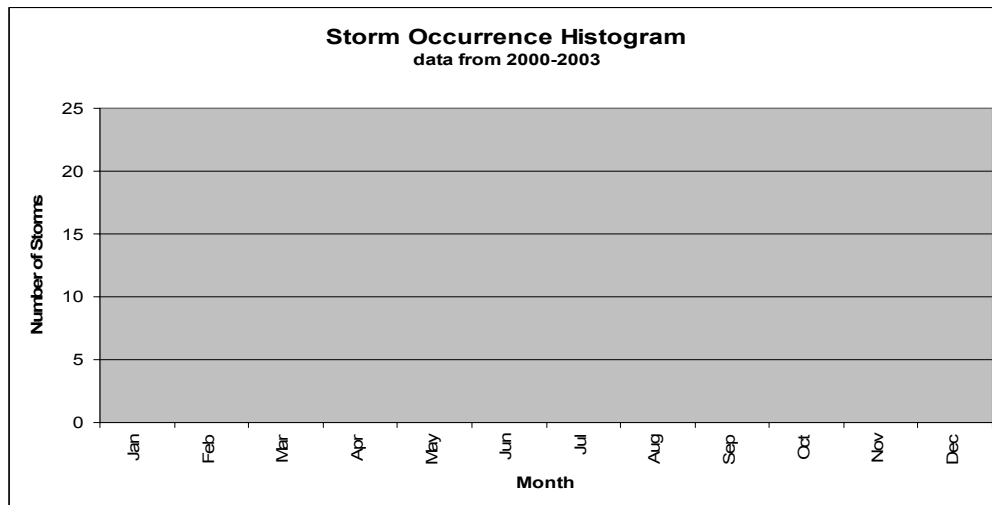
Occurrence Summary (beginning date)	
Month	# of Storms
Jan	
Feb	
Mar	
Apr	
May	
Jun	
Jul	
Aug	
Sep	
Oct	
Nov	
Dec	

Table 1B.

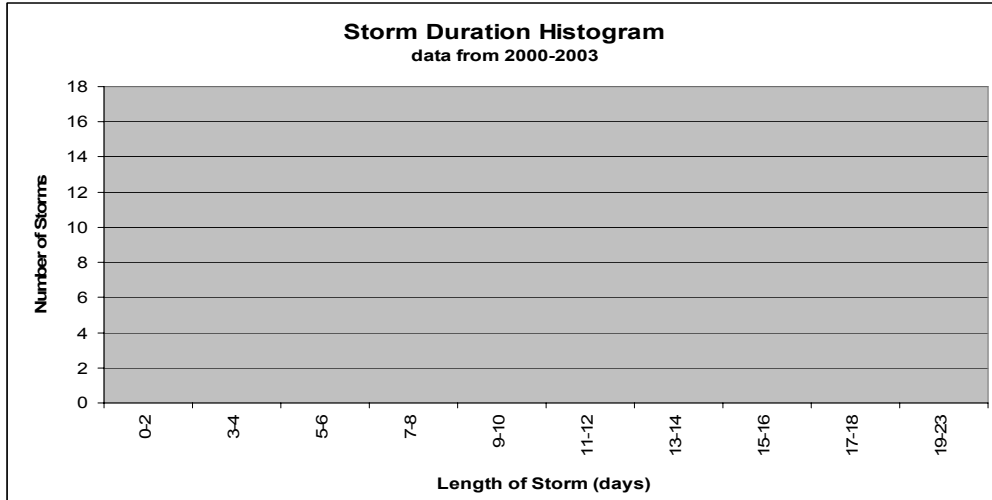
Duration Summary	
length (days)	# of Storms
0-2	
3-4	
5-6	
7-8	
9-10	
11-12	
13-14	
15-16	
17-18	
19-21	

Table 1C.

Storm Statistics (2000-2003)		
Longest (days)	Average Length (days)	Average Number per year



NSF Project: Cataclysms And Catastrophes



WEATHER-TRACKER TEAM: JOB REQUEST

TO: GROUP 2
FROM: REBECCA LONO
SUBJECT: POTENTIAL HURRICANE, INVESTIGATION IS REQUIRED

A tropical disturbance has formed off the western coast of Africa. Our satellites indicate that the cyclone is moving to the northwest. We have assigned your class to track this storm in order to determine whether it will present a threat to the Atlantic coast of the United States.

I have assigned your group to track the storm as it moves through Caribbean and Atlantic waters. I need your group to put together a color-coded map of the track and strength of the storm. Please consult **National Oceanic and Atmospheric Administration (NOAA) Storm Tracking Data (Table 2)** in order to give us an understanding of how this tropical cyclone has moved. The data have been provided by the National Hurricane Center. I would like to see the following items from your group:

- 1) A map of the storm's path, with each data point colored by storm strength. Use latitude and longitude locations provided in **Table 2** to determine location of points.
- 2) A color-keyed map categorizing storms as low pressure area, tropical depression, tropical storm, or hurricane. Remember that tropical cyclones are categorized by wind speed.
- 3) Highlight data points that correspond to midnight for each day. How far does the system move in a day?

Prepare your data to present to the rest of the class. Keep your presentation under 5 minutes.

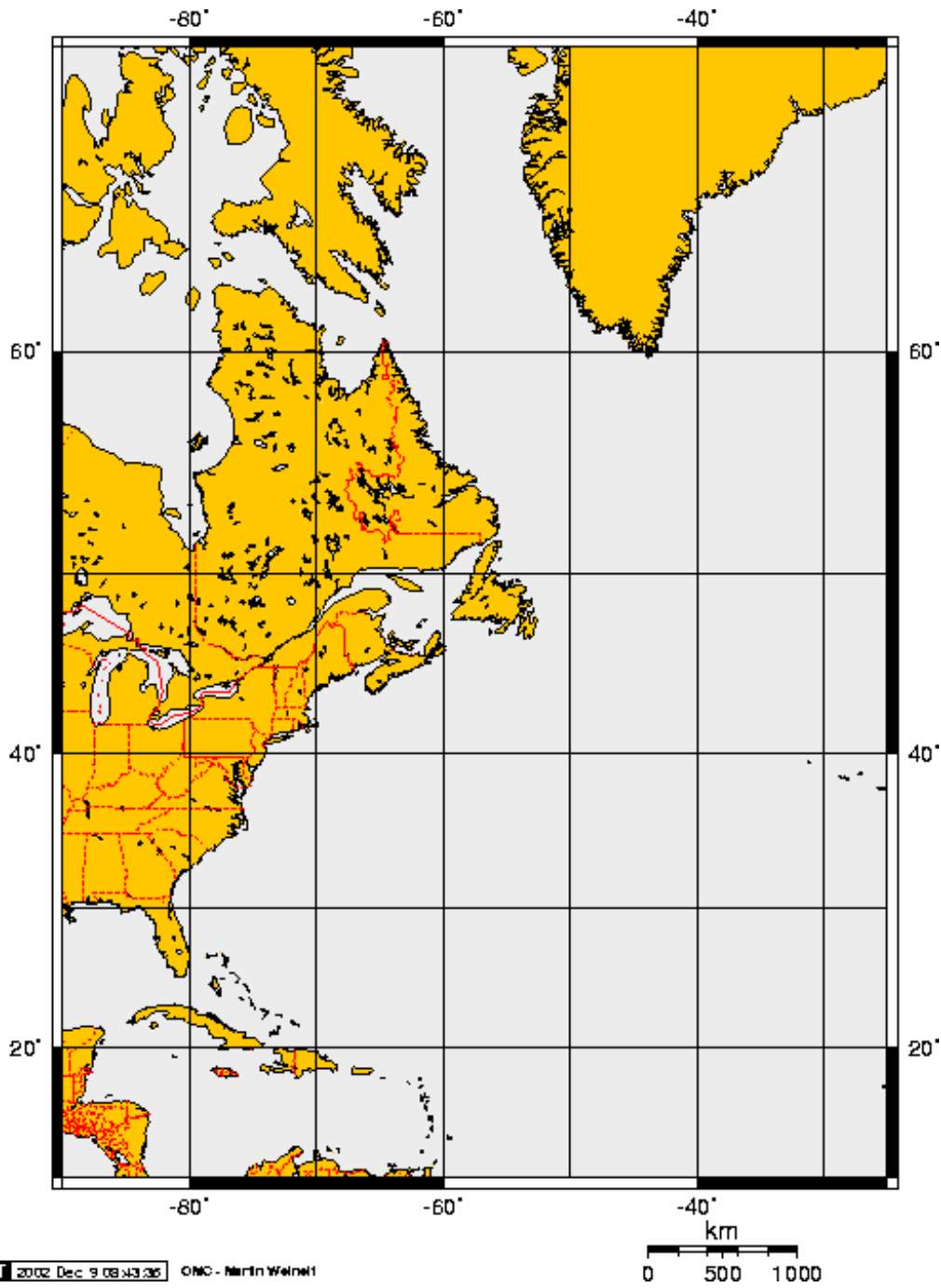
Because this was the fifth hurricane to occur in 2001 and the previous one had a masculine name, this system was given the name Erin.

Becky Lono

Rebecca Lono
Managing Director, Miami
National Hurricane Center

Table 2. NOAA Storm-Tracking Data

Date	Time	Position		Pressure (mb)	Wind Speed (kt)	Stage
		Lat. (°N)	Lon. (°W)			
Sep-01	18:00	12.5	34.3	1006	30	tropical depression
Sep-02	12:00	13.5	39	1003	45	tropical storm
Sep-03	00:00	14.7	42.2	1003	45	tropical storm
Sep-03	12:00	15.9	45.3	1003	50	tropical storm
Sep-04	00:00	16.7	48.7	1002	40	tropical storm
Sep-04	12:00	17	52	1000	45	tropical storm
Sep-05	00:00	17.4	54.8	1000	45	tropical storm
Sep-05	12:00	18.1	57	1013	35	tropical storm
Sep-06	00:00	20.1	58.1	1015	15	low pressure area
Sep-06	12:00	22.2	58.3	1014	20	low pressure area
Sep-07	00:00	23.9	58.1	1012	25	re-formed td
Sep-07	12:00	24.9	57.8	1008	30	re-formed td
Sep-08	00:00	26	58.3	1004	35	tropical storm
Sep-08	12:00	27.2	59.2	999	45	tropical storm
Sep-09	00:00	29.7	60.4	987	75	hurricane
Sep-09	12:00	31.5	62.2	979	95	hurricane
Sep-10	00:00	33.3	63.3	969	105	hurricane
Sep-10	12:00	34.9	64.7	969	100	hurricane
Sep-11	00:00	36.4	65.7	973	80	hurricane
Sep-11	12:00	37.4	65.6	976	80	hurricane
Sep-12	00:00	38	64.3	976	80	hurricane
Sep-12	12:00	37.9	62.6	979	75	hurricane
Sep-13	00:00	38.1	61.4	979	75	hurricane
Sep-13	12:00	38.8	60.6	982	70	hurricane
Sep-14	00:00	40.6	59.3	982	70	hurricane
Sep-14	12:00	43.3	56.7	987	65	hurricane
Sep-15	00:00	46.7	52.7	981	60	tropical storm
Sep-15	12:00	52	49	978	55	extratropical
Sep-16	00:00	58	46	972	55	extratropical
Sep-16	12:00	61.5	42	981	55	extratropical
Sep-17	00:00	65	35	995	40	extratropical



System Strength Key

tropical depression	light blue
tropical storm	yellow
low pressure area	orange
re-formed tropical storm	pink
hurricane	red
extratropical	grey

WEATHER-TRACKER TEAM: JOB REQUEST

TO: GROUP 3
FROM: REBECCA LONO
SUBJECT: HURRICANE ERIN WIND SPEEDS - INVESTIGATION IS REQUIRED

A tropical disturbance recently formed off the western coast of Africa. Our satellites indicate that the system is currently moving northward along the Atlantic coast of the United States. We have assigned your group the task of tracking the wind speeds associated with this system. The purpose is for you to understand how winds build up and die down during the life of a tropical cyclone.

I need your group to put together a cross plot and map of the wind speed data. Please consult **National Oceanic and Atmospheric Administration (NOAA) Wind Speed Tracking Data (Table 3)** in order to give us an understanding of how wind speed has changed during this storm. The data have been provided by the National Hurricane Center. I would like to see the following items from your group:

- 1) A **Maximum Sustained Surface Wind Speed** chart showing the wind speed of the cyclone as it moved up the east coast of the U.S.
- 2) A color-keyed map showing the wind speed.
- 3) A paragraph summarizing the wind behavior.

Prepare your products to present to the rest of the class. Keep your presentation under 5 minutes.

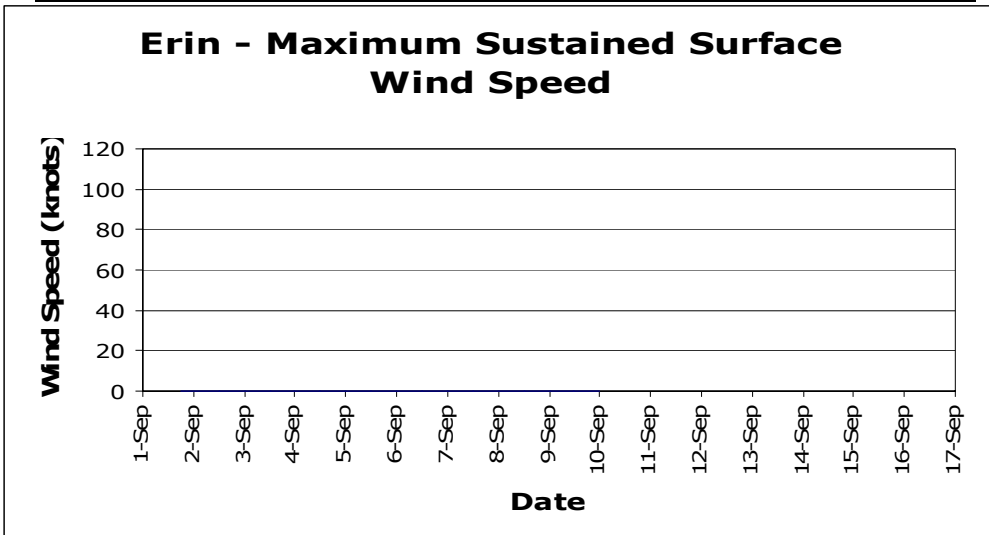
Since this was the fifth hurricane in 2001, and the previous one had a masculine name, this system was named Tropical Storm Erin and then Hurricane Erin.

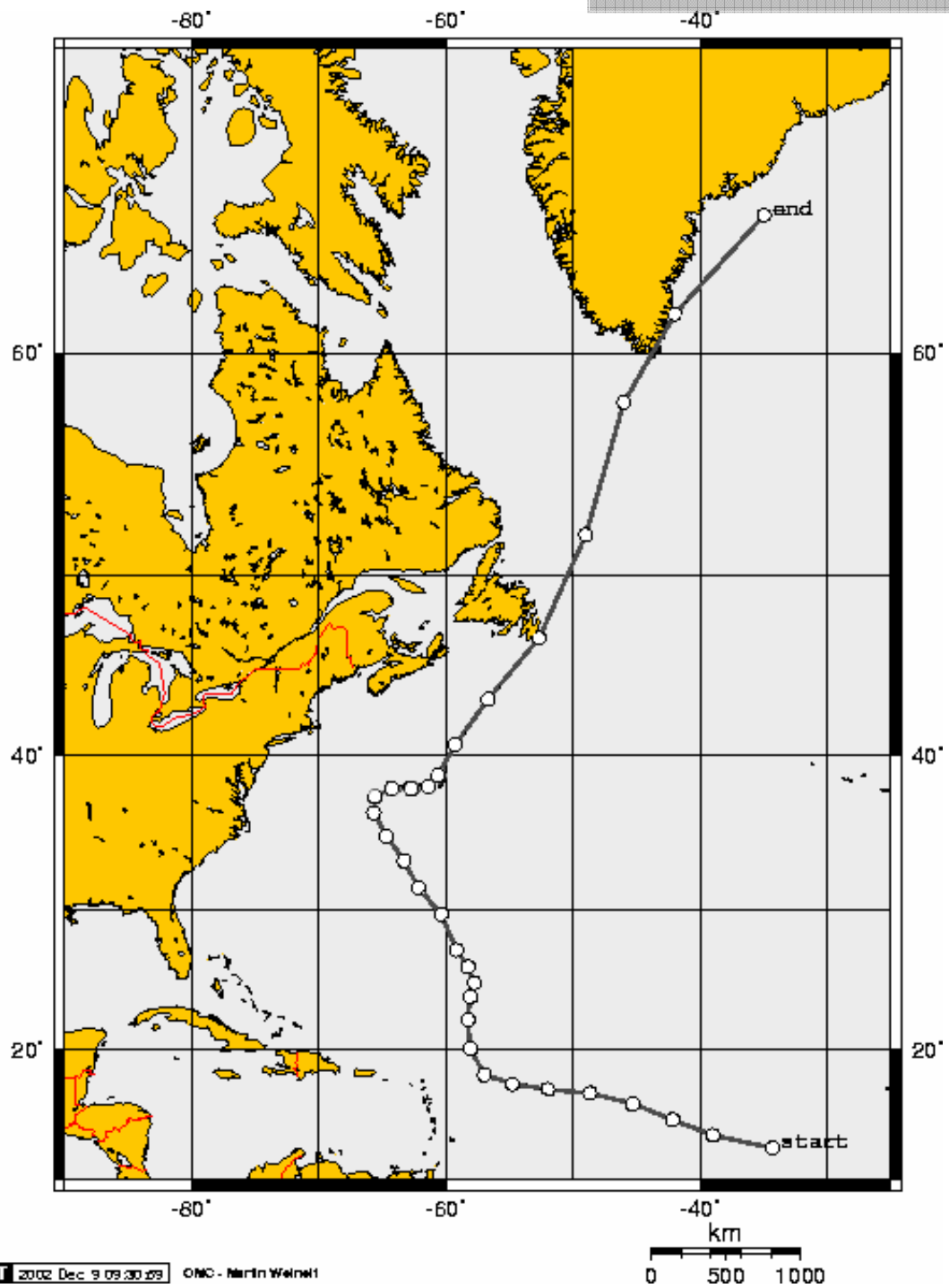
Becky Lono

Rebecca Lono
Managing Director, Miami
National Hurricane Center

Table 3. NOAA Wind Speed Tracking Data

Date	Time	Position		Wind	Stage
		Lat. (°N)	Lon. (°W)	Speed (kt)	
Sep-01	18:00	12.5	34.3	30	tropical depression
Sep-02	12:00	13.5	39	45	tropical storm
Sep-03	00:00	14.7	42.2	45	tropical storm
Sep-03	12:00	15.9	45.3	50	tropical storm
Sep-04	00:00	16.7	48.7	40	tropical storm
Sep-04	12:00	17	52	45	tropical storm
Sep-05	00:00	17.4	54.8	45	tropical storm
Sep-05	12:00	18.1	57	35	tropical storm
Sep-06	00:00	20.1	58.1	15	low pressure area
Sep-06	12:00	22.2	58.3	20	low pressure area
Sep-07	00:00	23.9	58.1	25	re-formed td
Sep-07	12:00	24.9	57.8	30	re-formed td
Sep-08	00:00	26	58.3	35	tropical storm
Sep-08	12:00	27.2	59.2	45	tropical storm
Sep-09	00:00	29.7	60.4	75	hurricane
Sep-09	12:00	31.5	62.2	95	hurricane
Sep-10	00:00	33.3	63.3	105	hurricane
Sep-10	12:00	34.9	64.7	100	hurricane
Sep-11	00:00	36.4	65.7	80	hurricane
Sep-11	12:00	37.4	65.6	80	hurricane
Sep-12	00:00	38	64.3	80	hurricane
Sep-12	12:00	37.9	62.6	75	hurricane
Sep-13	00:00	38.1	61.4	75	hurricane
Sep-13	12:00	38.8	60.6	70	hurricane
Sep-14	00:00	40.6	59.3	70	hurricane
Sep-14	12:00	43.3	56.7	65	hurricane
Sep-15	00:00	46.7	52.7	60	tropical storm
Sep-15	12:00	52	49	55	extratropical
Sep-16	00:00	58	46	55	extratropical
Sep-16	12:00	61.5	42	55	extratropical
Sep-17	00:00	65	35	40	extratropical





Wind Speed Key	
Wind Speed Range (kts)	
10 to 25	pink
30 to 45	green
50 to 65	yellow
70 to 85	orange
90 to 105	red

WEATHER-TRACKER TEAM: JOB REQUEST

TO: GROUP 4
FROM: REBECCA LONO
SUBJECT: HURRICANE ERIN ATMOSPHERIC PRESSURE CHANGES - INVESTIGATION IS REQUIRED

A tropical disturbance recently formed off the western coast of Africa. Our satellites indicate that the system is currently moving along the Atlantic seaboard. We have assigned your class to track the atmospheric pressure changes associated with this system in order to understand how pressure changes cause masses of air to build up and die down during a tropical cyclone.

I need your group to put together a cross plot and map of the barometer data. Please consult **National Oceanic and Atmospheric Administration (NOAA) Barometric Pressure Data (Table 4)** in order to give us an understanding of how this hurricane is behaving. The data have been provided by the National Hurricane Center. I would like to see the following items from your group:

- 1) A **Minimum Central Pressure** chart for the hurricane as it has progressed along the east coast of the U.S.
- 2) A color-keyed map showing the changes in pressure.
- 3) A paragraph summarizing the atmospheric pressure behavior as the storm has developed and dispersed.

Prepare your products to present to the rest of the class. Keep your presentation under 5 minutes.

Because this was the fifth hurricane of the year, and the previous one had a masculine name, this system was named Tropical Storm Erin and Hurricane Erin.

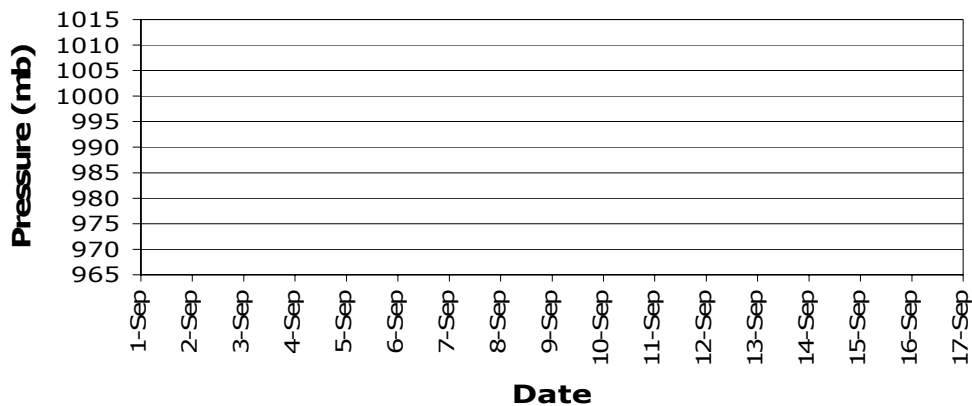
Becky Lono

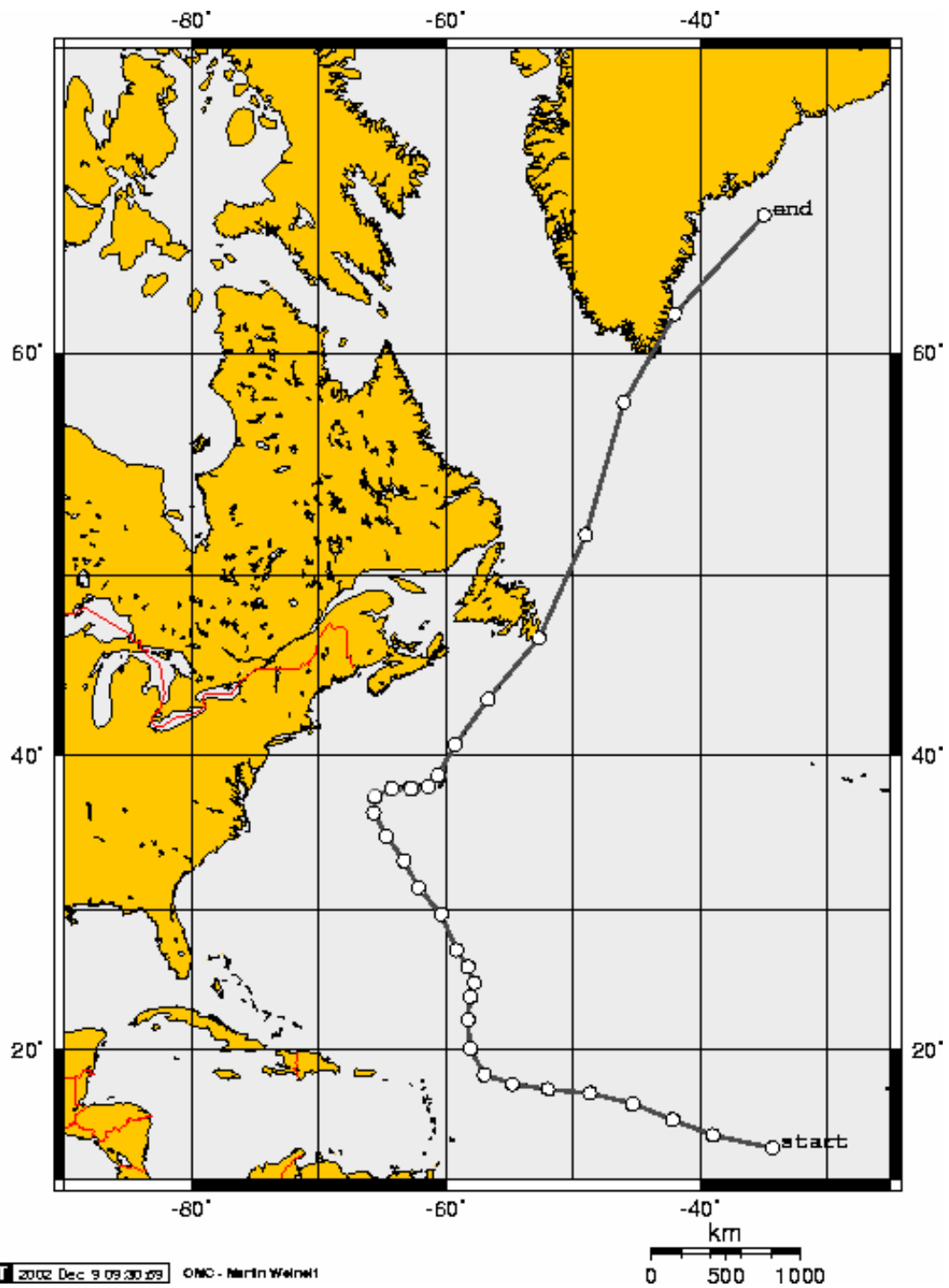
Rebecca Lono
Managing Director, Miami
National Hurricane Center

Table 4. NOAA Barometric Pressure Data

Date	Time	Position		Pressure (mb)	Stage
		Lat. (°N)	Lon. (°W)		
Sep-01	18:00	12.5	34.3	1006	tropical depression
Sep-02	12:00	13.5	39	1003	tropical storm
Sep-03	00:00	14.7	42.2	1003	tropical storm
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Sep-12	12:00	37.9	62.6	979	hurricane
Sep-13	00:00	38.1	61.4	979	hurricane
Sep-13	12:00	38.8	60.6	982	hurricane
Sep-14	00:00	40.6	59.3	982	hurricane
Sep-14	12:00	43.3	56.7	987	hurricane
Sep-15	00:00	46.7	52.7	981	tropical storm
Sep-15	12:00	52	49	978	extratropical
Sep-16	00:00	58	46	972	extratropical
Sep-16	12:00	61.5	42	981	extratropical
Sep-17	00:00	65	35	995	extratropical

Erin - Minimum Central Pressure





Barometric Pressure Key	
Pressure Range (mb)	
961 - 970	blue
971 - 980	pink
981 - 990	green
991 - 1000	yellow
1001 - 1010	orange
1011 - 1020	red

Questions:

1. During what month of the year between 2000 and 2003 did the greatest number of hurricanes occur?
2. How long did the average hurricane between 2000 and 2003 last?
3. How many tropical cyclones have turned into hurricanes this year?
4. What was the average number of hurricanes per year between 2000 and 2004?
5. What was unusual about Tropical Storm Ana in 2003?
6. Do tropical cyclones keep the same wind speed and barometric pressure throughout their lifetimes? If not, how do these characteristics change?
7. What is the main cause of hurricanes?
8. What major world event was taking place at the same time Hurricane Erin was moving northward along the Atlantic seaboard of the United States?