

## Chapter 20 Lab Activity B

### Hurricane Andrew

Like other Atlantic hurricanes, Andrew started as a low-pressure system in the tropics off the west coast of Africa. Warm water and moisture-laden air supplied the energy for it to strengthen into an ordinary and average tropical storm. Surface winds began to move the storm westward. Although all tropical storms form and develop in this way, only a few intensify into hurricanes. Most encounter upper air winds moving in the opposite direction as the surface winds. As a result, these storms weaken and soon die out. Tropical Storm Andrew, on the other hand, encountered upper air winds moving in the same direction as the surface winds. These reinforcing winds caused Andrew to quickly strengthen into an unusually powerful hurricane. Andrew proved to be the most intense Atlantic hurricane of the 20th century.

#### Procedure

- 1 Use the Hurricane Andrew Data Table on page 92 of the lab manual to plot the track of Hurricane Andrew on the map of the Southeastern United States on page 93 of the lab manual. Start with the data for August 23, 15:00.
- 2 Connect the points you have plotted, and draw an arrowhead to indicate the direction of Hurricane Andrew's movement.
- 3 Label each point you have plotted with the date and the time. For example, the data point for August 23, 15:00, should be labeled "23/15," the data point for August 23, 21:00, should be labeled "23/21."
- 4 Use a colored pencil to plot the data for Hurricane Andrew's wind speed versus time on the wind speed and pressure grid located under the map. Connect the data points with a smooth curve.
- 5 Use a second colored pencil to plot the data for the hurricane's air pressure versus time. Connect the points with a smooth curve.
- 6 Use the hurricane track you plotted in Steps 1–3 to determine the landfall times for the hurricane. Landfall occurs when the hurricane first passes over land. On your graph, use a third colored pencil and a ruler to draw vertical lines corresponding to the landfall times.
- 7 In a fourth color, draw a vertical line to indicate when Hurricane Andrew passed back onto the water after being on land.

#### Analysis and Conclusions

- 1 What is the difference between the highest and the lowest air pressure values given in the data table? Would you expect this value to be more or less than the air pressure change across a typical mid-latitude low?

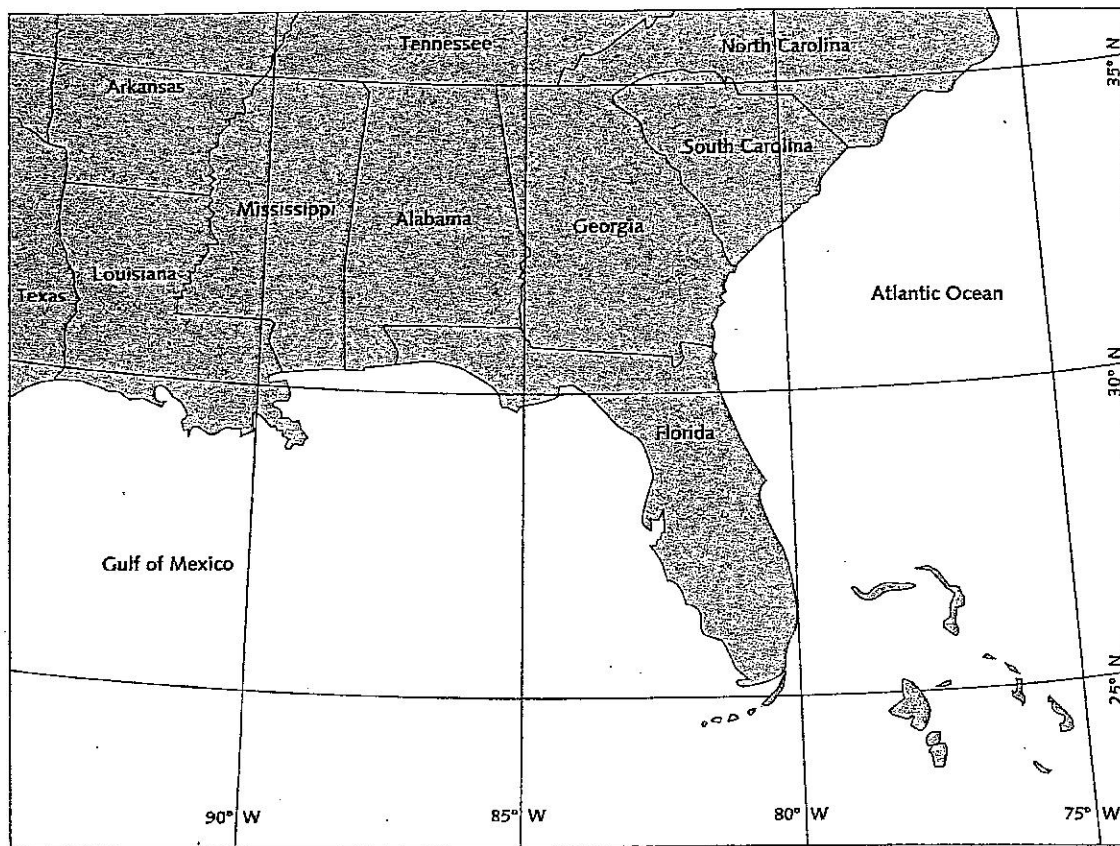
#### LAB SKILLS AND OBJECTIVES

- *Graph and interpret* hurricane weather data.
- *Construct a* hurricane track for Hurricane Andrew.
- *Correlate a* hurricane track with the weather data.

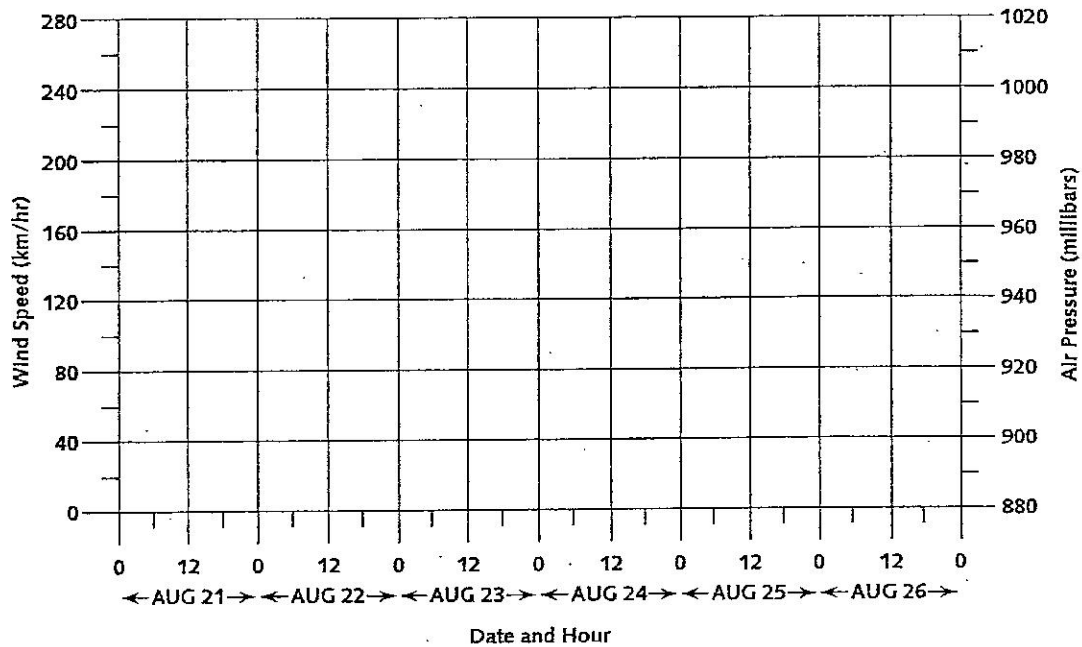
#### MATERIALS

- colored pencils
- ruler

| Hurricane Andrew Data Table |                         |                  |                   |                       |                      |
|-----------------------------|-------------------------|------------------|-------------------|-----------------------|----------------------|
| Date                        | Time<br>(24-hour clock) | Latitude<br>(°N) | Longitude<br>(°W) | Wind Speed<br>(km/hr) | Air Pressure<br>(mb) |
| Aug 21                      | 03:00                   | 23.7             | 63.0              | 80                    | 1013                 |
|                             | 09:00                   | 24.3             | 63.7              | 96                    | 1006                 |
|                             | 15:00                   | 24.7             | 64.6              | 96                    | 1007                 |
|                             | 21:00                   | 25.2             | 65.4              | 96                    | 1004                 |
| Aug 22                      | 03:00                   | 25.6             | 66.5              | 102                   | 1001                 |
|                             | 09:00                   | 25.8             | 67.5              | 120                   | 994                  |
|                             | 15:00                   | 25.9             | 69.0              | 148                   | 974                  |
|                             | 21:00                   | 25.9             | 70.4              | 157                   | 974                  |
| Aug 23                      | 03:00                   | 25.6             | 71.9              | 176                   | 959                  |
|                             | 09:00                   | 25.5             | 73.4              | 192                   | 951                  |
|                             | 15:00                   | 25.4             | 75.0              | 216                   | 930                  |
|                             | 21:00                   | 25.4             | 76.5              | 241                   | 923                  |
| Aug 24                      | 03:00                   | 25.4             | 78.1              | 226                   | 931                  |
|                             | 09:00                   | 25.4             | 80.3              | 226                   | 932                  |
|                             | 15:00                   | 25.7             | 82.1              | 226                   | 945                  |
|                             | 21:00                   | 25.8             | 83.9              | 226                   | 945                  |
| Aug 25                      | 03:00                   | 26.3             | 85.7              | 226                   | 945                  |
|                             | 09:00                   | 26.8             | 87.0              | 226                   | 949                  |
|                             | 15:00                   | 27.5             | 89.2              | 226                   | 944                  |
|                             | 21:00                   | 28.2             | 90.2              | 226                   | 937                  |
| Aug 26                      | 03:00                   | 29.0             | 91.1              | 226                   | 940                  |
|                             | 09:00                   | 29.7             | 91.7              | 185                   | 954                  |
|                             | 15:00                   | 30.5             | 91.6              | 120                   | 987                  |
|                             | 21:00                   | 30.6             | 91.6              | 80                    | 991                  |



HURRICANE ANDREW WIND SPEED AND PRESSURE



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Laboratory Manual**

- 2** Between August 24, 15:00, and August 26, 03:00, the wind speed for Hurricane Andrew remained essentially the same. Where was Hurricane Andrew located during this period of time?

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- 3** According to your graph, what is the general relationship between air pressure and wind speed?

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- 4** How did Hurricane Andrew's air pressure and wind speed change after both of the hurricane's landfalls?

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- 5** How did Hurricane Andrew's air pressure and wind speed change after the hurricane left the west coast of Florida and moved over water?

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- 6** Explain why air pressure and wind speed are affected by the surface over which a hurricane moves.

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- 7** Compare the length of the hurricane track between the points plotted for August 24, 15:00, and August 25, 15:00, to the length of the track between August 25, 15:00, and August 26, 15:00. During which twelve-hour time period did the hurricane move faster? Why did the hurricane's speed change?

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- 8** A tropical storm officially becomes a hurricane when it attains speeds greater than 119 kilometers per hour. When did Hurricane Andrew change from a tropical storm to a hurricane? When did it change back to a tropical storm?

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