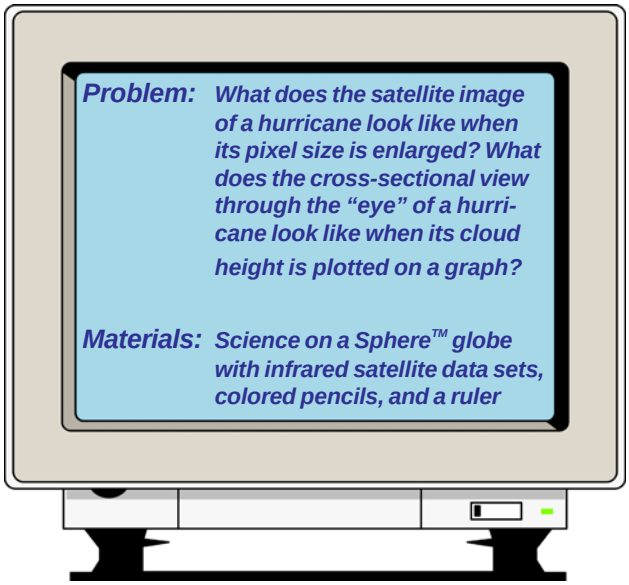


Background

Part A

Sensors on satellites scan the Earth in small blocks, called pixels, to detect infrared (heat) radiation as numerical data (temperature). Then, computers convert the data to an image. Therefore, the smallest building block of a satellite picture is also called a pixel.

Procedure

Part A

1. Using Figure A2.1, color each square on the graph according to Table A2.1, the infrared color table. The graph represents a satellite infrared image of Hurricane Georges - eye and main central area - September 25, 1998. Each square represents one pixel of the satellite infrared image.

Questions

Part A

1. Define Infrared.

2. How would you describe the shape of the hurricane from the top looking down?

3. If each pixel represents 32 kilometers, then what is the approximate length and width of the hurricane?

4. What is the approximate diameter in kilometers of the hurricane's "eye" (the center of the hurricane)?

FYI

In a hurricane, the highest winds and heaviest rainfall occur in the area next to the "eye"...called the "eyewall".

5. What two colors represent the area with the heaviest rainfall and highest wind speed?

6. What two colors represent the area with little or no rainfall and wind?

FYI

1	1	1	1	1	2	3	1	1	3	5	4	4	5	4	5	4	6	4	1	1	1	1	1	1
1	1	1	1	2	2	4	2	3	3	3	5	6	5	5	4	3	6	6	3	1	1	1	1	1
1	1	1	1	1	2	2	3	3	4	6	6	6	6	5	5	5	4	3	4	2	2	1	1	1
1	1	2	1	2	2	3	4	5	6	7	7	7	7	7	6	6	4	4	4	3	3	1	1	1
1	1	1	2	2	3	3	4	6	7	7	7	7	7	7	7	7	6	5	7	4	2	1	1	1
2	1	2	2	3	3	4	6	7	8	8	7	7	8	7	7	7	6	5	7	4	2	1	1	1
1	1	2	2	3	4	6	7	7	8	8	8	8	8	8	7	7	7	7	6	5	4	2	2	2
1	2	2	2	4	4	6	7	8	8	8	8	8	8	8	7	7	7	6	7	6	4	2	1	1
1	2	2	2	4	4	6	7	7	8	7	7	7	7	8	8	7	7	7	5	6	6	4	2	1
1	2	2	3	4	4	6	7	7	8	7	7	7	7	8	8	7	7	7	6	5	6	5	2	1
1	2	2	3	4	4	5	7	7	7	7	3	7	7	8	8	7	7	7	6	6	6	6	3	4
1	2	2	3	4	5	5	6	6	7	6	6	7	8	8	7	7	7	7	5	6	6	4	4	6
1	2	3	3	4	4	5	5	7	7	7	8	8	8	8	7	7	6	6	4	5	7	5	5	2
1	3	3	3	6	4	4	5	6	6	8	8	8	8	8	8	7	6	5	4	5	6	5	4	2
2	3	4	2	6	6	5	6	6	7	8	8	8	8	8	7	6	6	5	5	5	5	4	4	2
2	5	6	6	6	5	5	4	6	8	8	8	8	8	7	7	6	6	6	6	5	4	4	2	2
4	3	6	5	6	5	5	5	7	7	7	7	8	8	7	6	6	5	6	7	4	5	5	2	1
4	4	5	5	4	5	4	6	7	7	7	8	8	7	7	5	6	4	5	4	4	5	5	1	1
3	2	4	5	5	6	6	7	7	7	7	6	7	6	5	5	4	4	7	4	4	4	3	2	1
1	2	3	4	4	5	6	6	6	6	7	7	6	5	5	5	4	3	6	4	2	4	2	2	1
1	1	4	3	4	5	6	6	6	6	5	5	5	5	4	4	6	5	6	4	4	3	4	1	3
1	1	1	3	4	5	6	5	6	4	5	6	5	3	3	4	4	4	2	3	4	2	2	3	2
1	1	1	2	2	3	3	2	1	3	4	4	4	4	6	4	2	2	3	2	2	2	1	6	7
1	2	4	5	5	4	2	4	4	4	4	5	5	6	4	3	2	2	3	2	4	1	4	6	7
1	1	1	3	2	2	4	4	4	4	5	5	5	2	2	2	2	2	2	2	4	1	6	6	1

Figure A2.1. Satellite Image of Hurricane Georges - Eye and Main Central Area - September 25, 1998 - Each Numbered Square is One Pixel

Black - 1	White - 3	Yellow - 5	Red - 7
Gray - 2	Blue - 4	Orange - 6	Purple - 8

Table A2.1. Satellite Infrared Color Table

Act 2-2

Background

Part B

Instruments on weather balloons provide numerical data such as temperature, air pressure, wind speed, wind direction and relative humidity as the balloon rises through the atmosphere. Therefore, researchers have made standard information tables that relate the approximate height of a cloud to its approximate temperature. Refer to Table A2.2. Since we know the temperature of the cloud tops for this hurricane, we can use a standard table to find the approximate cloud height. Then, you can plot the cloud height vs. distance to get a cross-sectional view through the "eye" of this hurricane.

Procedure

Part B

Use Figure A2.2 for these steps.

1. Along the x-axis (horizontal) at the bottom of Figure A2.2, number from zero to 800, counting by 32s. The first four are done for you so you can see the pattern. Label the x-axis "West - East Distance Through the Eye of a Hurricane (kilometers)". Along the y-axis (vertical) at the left-hand side of Figure A2.2, number from zero to 20,000 by 1000s. Label the y-axis "Cloud Height (meters)".

2. From Figure A2.1, your colored image of a hurricane's eye and central area from Procedure - Part A, locate the line of pixels from west to east (left to right) on Figure A2.1 that runs directly through the "eye" of the hurricane. Notice that the first pixel is black.

3. Use Table A2.2 to find the approximate cloud height represented by the color black.

4. At "32 kilometers", plot the cloud height.

5. Continue the same procedure for the next pixel in the line (gray), that is, find its cloud height in Table A2.2 and plot it at the next kilometer value (64). Now continue the procedure for each successive pixel across the entire line.

6. Draw another y-axis on the right-hand side of the graph. Label this y-axis "Approximate Temperature (degrees Celcius).

7. Now write the temperature or temperature range, listed in Table A2.2, on the right-hand side, opposite its corresponding height in meters on the left-hand side. For example, write "-30 to -39" opposite 5000 meters.

8. Write a title for your graph.

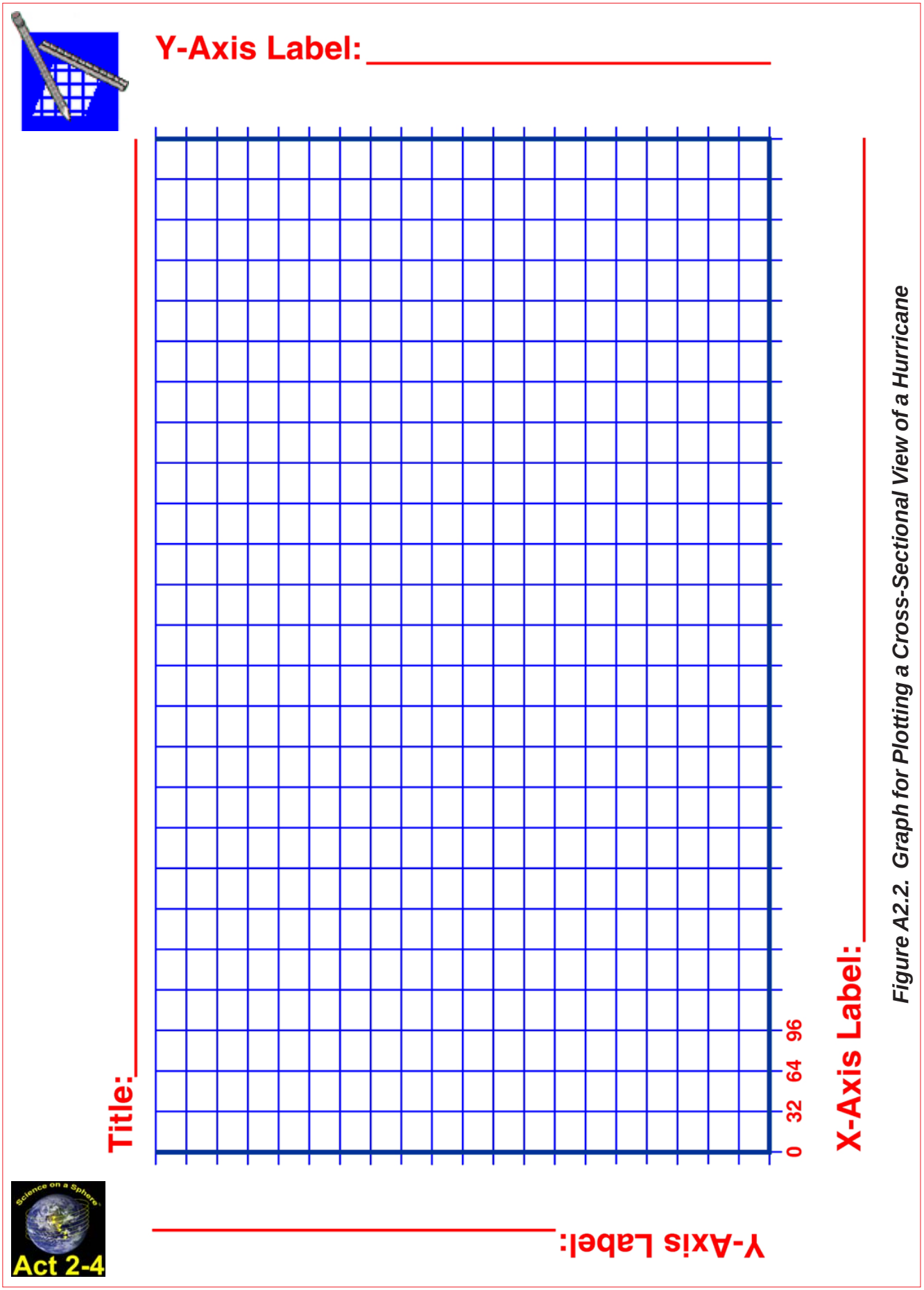
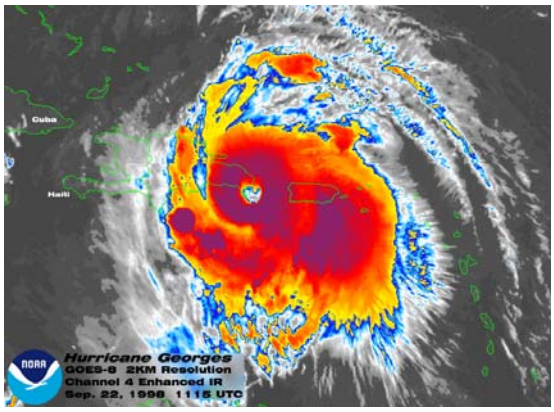


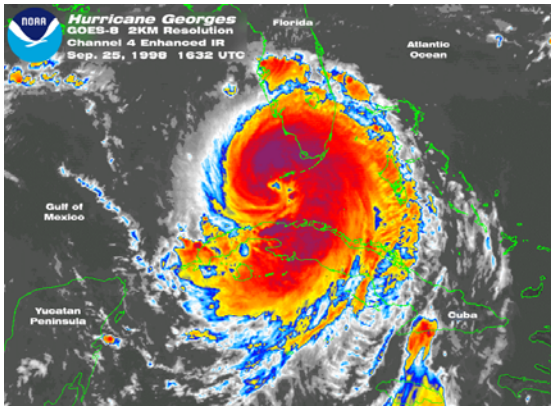
Figure A2.2. Graph for Plotting a Cross-Sectional View of a Hurricane

Color Number	Color Name	Approximate Temperature (degrees C)	Approximate Height (meters)
1	Black	+15	100
2	Gray	-10 to -19	1500
3	White	-20 to -29	3000
4	Blue	-30 to -39	5000
5	Yellow	-40 to -45	9000
6	Orange	-46 to -51	12,000
7	Red	-52 to -57	14,000
8	Purple	-58 to -68	16,000

Table A2.2. Color Number/Color Name/ Temperature/Height Data Table



These two images are actual GOES-8 pictures of Hurricane Georges as it crossed the Caribbean through the Dominican Republic, Haiti, Cuba, and South Florida during late September 1998.



Compare these two images, particularly the one dated September 25, 1998, with the picture of the center of a hurricane you created in Figure A2.1 and see how they are similar.

Questions

Part B

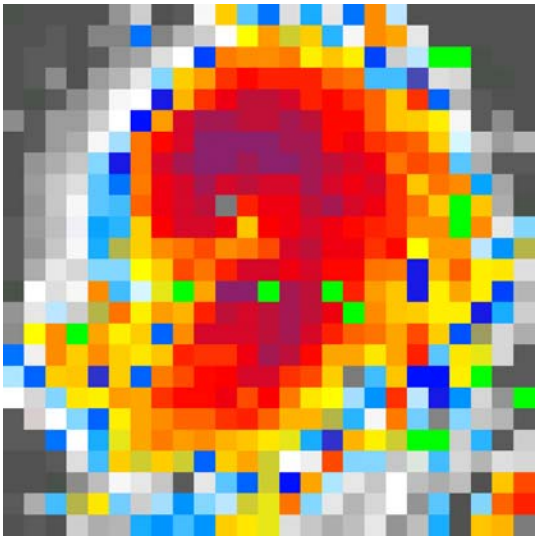
1. Define the "eye" of a hurricane.
2. Describe the shape of your graph.
3. Where is the "eye" of the hurricane located on your graph?
4. On your graph, where would the thicker, colder clouds be located?
5. On your graph, where would the heaviest rainfall and highest winds be located?
6. Draw seven arrows showing the wind direction in different parts of the hurricane.

Act 2-5

Conclusion

Review the problem stated on the first page and write a detailed conclusion.

Act 2-6



Compare this image, a highly detailed portion of the center and eye of Hurricane Georges, with the picture of the center of a hurricane you created in Figure A2.1 and see how they are similar.

Answer Key
Part A

1. Part of the invisible electromagnetic spectrum; heat energy.
2. Like a "comma". Accept any reasonable description.
3. Approximately 800 x 800 kilometers.
4. Approximately 32 kilometers.
5. Purple and red.
6. Black and gray.

Answer Key
Part B

1. Center of the hurricane where the weather is calm with light winds; rain stops for a short time, then resumes.
2. Moving west to east, clouds get higherand colder, suddenly disappear, suddenly reappear, then disappear again.
3. Where the cloud height is zero toward the center of the graph.
4. Beneath the higher clouds.
5. Beneath the higher clouds.
6. One arrow represents each color except black. All arrows should indicate movement in a counterclockwise direction (cyclonic low).

Act 2-7