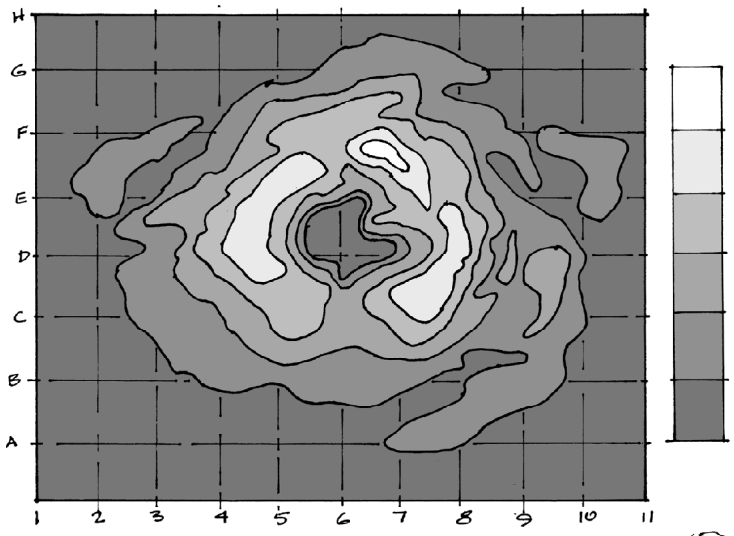

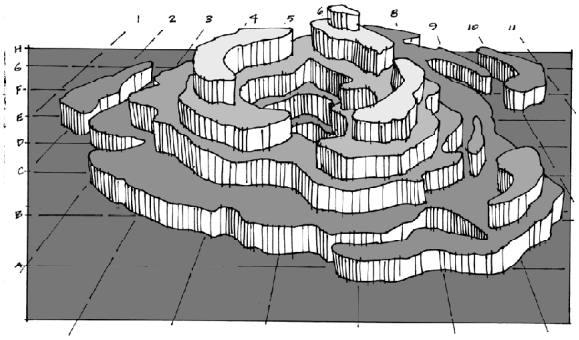

CLOUD HEIGHT AND TEMPERATURE

The temperature of the atmosphere above Earth changes with changes in altitude. Hurricanes and other weather phenomena originate in the troposphere, the first 9-12 kilometers of the atmosphere. The temperature of the troposphere depends on heat radiated from the Earth's surface and therefore decreases with increasing distance from the Earth. Since the heat radiating from the Earth's crust changes with latitude and season, the height of the tropopause (the top of the troposphere) varies accordingly.

Satellites measure the temperature of the clouds. Higher clouds are generally colder clouds. On the satellite image, the temperature is depicted in varying shades of gray. Darker areas are the warmest parts of the satellite image and whiter areas are the coldest. Since the coldest clouds appear to be all the same temperature, scientists color the whitest whites different colors, each color representing a temperature.

Learning Objective: Students will understand the correlation between cloud height and temperature

Challenge: Make a three-dimensional model of a hurricane

Materials: Clay, paper, pencils, ruler, infrared satellite image (available from http://storm.atms.purdue.edu/WXP/maps/hurricane/1996/FRAN/0109606i.gif), and the color scale from http://storm.atms.purdue.edu/WXP/satellite_det.html#infrared_enh

Procedure:

1. Using a ruler, draw the lines of latitude and longitude on the blank piece of paper and determine the scale of the satellite image and the blank paper.

2. Examine the satellite image and determine the temperature of the clouds at the intersection of the lines of latitude and longitude.

3. Note the temperature of the cloud on the piece of paper. Using the information to the right, translate that information into height of the cloud.

Cloud Height (kilometers)	Temperature (˚Celsius)
0	15
1.25	8
2.50	-1
3.75	-6
5.00	-13
6.25	-24
7.50	-34
8.75	-41
10.00	-50
11.25	-57

4. Once the students have determined the height of the clouds above the surface, it is time to create the three dimensional model. Translate the cloud height numbers from Step 4 into the appropriate height using the scale that was determined for the model in Step 2.

5. Starting at one corner, build a clay tower corresponding to the temperature measured (and converted) of the cloud. Working across the paper, repeat this step for each of the measurements.

When you are done you will have a three-dimensional model of Hurricane Fran. The computer at NASA followed the same steps, only with far more data points.

Note that this activity can also be done with a wire frame and paper mache, bricks, or any number of building materials. Students can also create their own color scale depicting temperature of the clouds in the building material of their choice.