

MY NASA DATA Lesson:

Does Humidity Affect Cloud Formation?

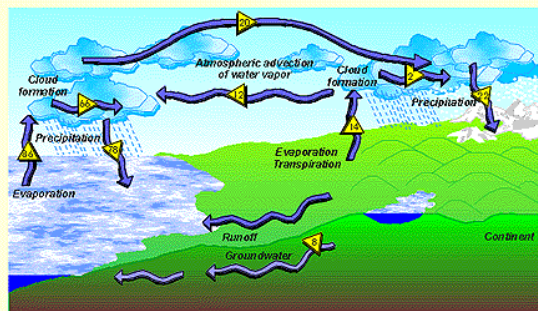
Purpose:

Students will use S'COOL data to identify factors that affect cloud formation.

Grade Level: 6 – 8

Estimated Time for Completing Activity:

4 – 50 minute class periods including extensions



The hydrological cycle model.
The hydrological cycle model with percentages and directional arrows denoting flow paths. Global average values are shown as percentages.

Image courtesy CyberNatural Software Group at the University of Guelph

Learning Outcomes:

- Able to find a data set using the S'COOL database
- Use Excel to manipulate the data
- Isolate relevant data
- Create meaningful graphs from a spreadsheet
- Ask data-related questions to be researched

Prerequisite

- Cloud observations
- S'COOL Reporting
- S'COOL Cloud activity for making a cloud in a bottle (See SCOOOL Cloud Cookery and ID Chart under Lesson Links)
- Basic use of Excel

Tools

- Computer with Excel and Internet access

Vocabulary:

- [cloud](#)
- [cloud coverage](#)
- [dew point](#)
- [relative humidity](#)

Lesson Links:

- [Thunderstorm Applet](#)
- [SCOOL Home Page](#)
- [SCOOL Cloud ID Chart and Cookery](#)
- [High Level Cloud Coverage versus Humidity Excel Graph](#)
- [Low Level Cloud Coverage versus Humidity Excel Graph](#)
- [Mid Level Cloud Coverage versus Humidity Excel Graph](#)

Background:

Clouds play an important role in the radiation budget of the earth. Clouds form when the dew point and the temperature of the air are the same. Sunlight causes water to evaporate into the atmosphere. This air containing the water vapor is heated at the surface of the Earth and rises. As it rises, it cools and the water vapor condenses on some form of particulate matter such as dust, ash, or smoke to form clouds.

Clouds can cause the Earth to warm or to cool. High clouds allow the Sun's energy to warm the Earth. Because they are so high in the sky, they do not give off much heat. So, high clouds tend to warm the Earth. Low clouds tend to reflect the Sun's energy back into space. Because they are low in the atmosphere they give off more heat than high clouds. So, low clouds tend to cool the Earth.

Procedure:

- A. Access data and display in a spreadsheet
1. Go to S'COOL website.
 2. Click on the For Participants button, then on Database.
 3. Select 'Search all S'COOL observations'.
 4. Select the following dates: Starting 2005, 01, 15 and Ending 2005, 01, 20.
 5. Choose USA.
 6. Click 'Submit Query Request'.
 7. Remember to only analyze data from the Terra Satellite

8. After the data has finished loading, scroll to the bottom of the page.
9. Click on 'Directions for How to Download Spreadsheet File'.
10. Follow these directions to download the data into an Excel spreadsheet.

B. Graph the data using Excel

1. On the spreadsheet, highlight Column V (Relative Humidity) and Column AG (Low Cloud Coverage).
2. From the toolbar, click on the Chart Wizard icon.
3. Under Chart type, select XY (Scatter)
4. Under Chart sub-type, select the first sub-type 'Scatter'
5. Click on Next
6. At the next window, click Next.
7. In the next window (Chart options window), in the chart title box, type the title of the graph 'Low Level Coverage vs Humidity'
8. For Value (x) axis, type 'Relative Humidity (per cent)'
9. For Value (y) axis, type 'Low Level Cloud Coverage (per cent)'
10. Click Next.
11. Save the graph to a separate sheet. See the Links section for a sample graph.
12. Click Finish.
13. Repeat the procedure for two more graphs: Mid Cloud Cover vs Relative Humidity , and High Cloud Cover vs Relative Humidity. See the Links section for sample graphs.
14. Use the three graphs, along with research books and materials provided by the teacher, to answer the Question section.

Questions:

Does humidity affect cloud formation? Explain your answer using specific data from your graph.

Extensions:

Extension 1.a.: (Guided discovery): Each group generates a list of other questions about cloud formation, to investigate the relationship between amount of clouds and the other surface measurements. Each group chooses a question that has been raised about the set of data in the spreadsheet, and develops a plan to answer that question, then all groups answer the Culminating Question (See below)

Extension 1.b.: (Problem-based inquiry): . For each surface measurement on the data spreadsheet, the student group would formulate a hypothesis about the relationship between each surface measurement and cloud cover. Following the same procedure and time period as was used for the initial lesson on humidity and cloud cover, the students would graph the data, and report their findings. Finally, all groups would answer the Culminating Question (See below)

Extension 1.c.: (Structured inquiry): Each group may be assigned or or more of the following two questions, then all groups answer the Culminating Question (See below)

1. Does temperature affect cloud formation? Explain your answer using data from your graph.
2. Does barometric pressure affect cloud formation? Explain your answer using data from your graph.

Culminating question: Which surface measurement best predicts cloud cover? Explain your answer using reports from all groups.

Lesson plan contributed by Judy Bradley, Plymouth, MA

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