

CLOUDSAT TOTAL SKY IMAGING PROTOCOL

Field Guide

Tasks

- Use a digital camera to record images of the clouds in the total sky as reflected in a convex mirror.
- Use a digital camera to record clouds in the sky in the four cardinal directions.

What You Need

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| <input type="checkbox"/> Digital camera | <input type="checkbox"/> Compass |
| <input type="checkbox"/> Convex mirror (24 or 30 cm diameter)
(labeled 'N' for 'north') | <input type="checkbox"/> Sunglasses |
| <input type="checkbox"/> Tripod | <input type="checkbox"/> <i>CloudSat Education Network Data Sheet</i> |

In the Lab

1. Determine the date and time of the CloudSat overpass for your location by either: a) going to the CloudSat Education web pages (<http://cloudsat.atmos.colostate.edu/cen/login.html>), logging on with your school GLOBE ID and CloudSat password, and running the automatic overpass predictor, or b) accessing the NASA Langley CloudSat Orbital Prediction Tool from the CloudSat home page (<http://www-angler.larc.nasa.gov/cgi-bin/predict/cloudsat.cgi>) and entering your location's latitude and longitude to determine the overpass dates.
2. Using the camera's instruction manual, familiarize students with the use of the digital camera including how to use the zoom lens and timer features and how to set the photograph size.
3. Before going outside to make observations, a student or teacher should check the charge level of the camera battery and confirm that the memory card is in the camera. Also confirm that the camera image size is set to the 1600x1200 setting. (**NOTE:** if you have trouble submitting the photographs over the internet, refer to the camera instructions on how to select a smaller image size.)

In the Field

1. Go outside to your GLOBE atmosphere study site during the date and time of the NASA CloudSat satellite overpass for your location.
2. At the atmosphere study site proceed to make observations on cloud and contrail type, cloud and contrail cover, precipitation and current temperature according to GLOBE and CloudSat protocols. Record your data on the *CloudSat Education Network Data Sheet*.
4. Use your compass to determine which direction is north, east, south and west for the quadrants.
5. Make *CloudSat Cloud Quadrant Protocol* observations for cloud type and percent cover in each quadrant (fourth) of the sky. Take a photograph of each quadrant as you are making your observations. This will result in 4 photographs - one to the north, one to the east, one to the south and one to the west. (Caution: **NEVER** look at the sun. If the sun is too bright in a quadrant, do not take the photograph.) Record your data on the *CloudSat Education Network Data Sheet*.

6. Note the order in which you took the photographs (for example – “We took the first photograph facing north, the second facing east...”) in the *Comments* section of the *CloudSat Education Network Data Sheet*. Record anything else that will help you distinguish the photographs from one another when you return to the classroom. **NOTE:** The photographs **MUST** be labeled correctly for the students and the CloudSat scientists to be able to compare the images to CloudSat radar data.

7. Place the convex mirror on the ground or on a flat surface close to the ground.

8. Position the tripod on the north side of the mirror and attach the digital camera. The camera is equipped with a zoom feature so the height of the tripod is not critical. Raise it to a height that is comfortable for the students.

9. To protect your eyes from sun glare, use sunglasses as a precaution or have other students stand with their backs towards the sun blocking the reflection of the sun on the mirror. Tilt the camera down until you have a good view of the mirror. Use the zoom feature on the camera to fill the camera’s field of view with the image of the mirror. The ‘N’ for ‘north’ **MUST** be visible in the photograph. Try setting the timer and stepping away so as not to be included in the photograph (not required). More sky will be visible in the mirror without the photographer’s reflection. Have two or three different students take photographs of the mirror with its view of clouds directly overhead.

10. When you are finished with this activity, place the mirror back into its plastic bag to prevent scratching and store it in a safe place. Leaving the mirror exposed to changing weather conditions may result in loss or damage to the mirror.

11. In the classroom, choose the photograph of the mirror with the best view of the clouds. You should now have five photographs to submit to CloudSat. These are the photos in the four cardinal directions and the best photograph of the clouds in the mirror.

12. Have the students label the five photographs that they will send to CloudSat. To do this, either refer to the camera instruction manual or download the photographs to a computer. Right-click on the photograph number assigned by the camera underneath the image, select ‘Rename’, and type in the following information. Include your school’s GLOBE ID, the date (ddmmmyy) and the letter representing the direction of the photograph or “M” for the mirror image (i.e. “N” = North, “S” = South, “E” = East, “W” = West, and “M” = image from the mirror). For example, a photograph taken to the north by a fictional Colorado school on December 10, 2006, would have this label: USCOXYZ7_10Dec06N.

13. Photographs may be submitted on-line on the CloudSat data entry page (best option) or e-mailed to cloudsatoutreach@atmos.colostate.edu. To submit on-line, log in and go to the bottom of the data entry web page where there are 5 input boxes (1 for each photo) for locating the files to upload. Use the 'Browse' buttons located next to the input field to locate the files on your hard drive. Click on 'submit' as normal, and the files are uploaded, automatically renamed and resized, and stored on the server in each school's folder. If e-mailing is preferable, have the subject of the e-mail be “CloudSat Cloud Photos” and include the following information in the body of the e-mail message to ensure that CloudSat is able to match the photographs to your school: GLOBE ID, school name, atmospheric site (for example, ATM-01 or the site’s name such as “Playground”), date and time (UT) and any additional information that you want CloudSat scientists to know.