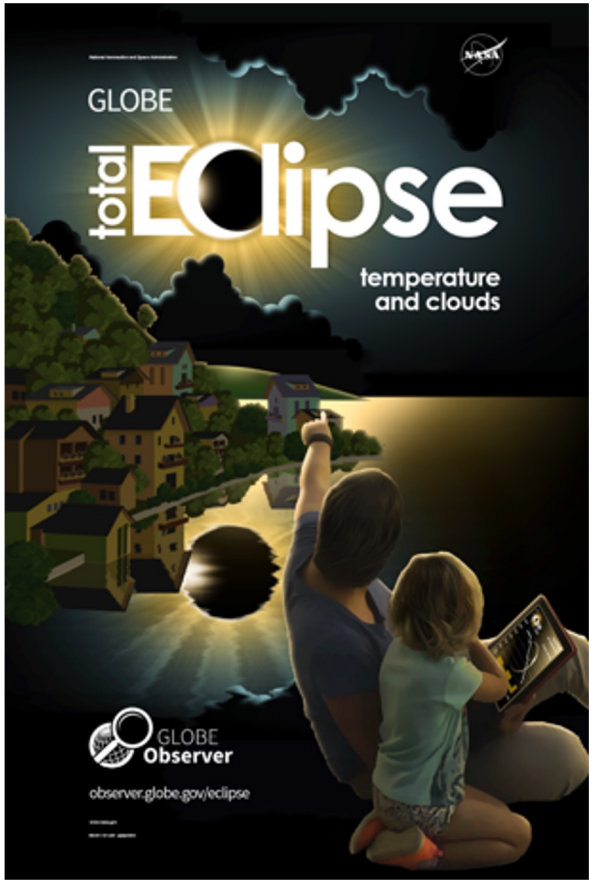
What about clouds?

Or individuals who can’t watch the eclipses?


What if I'm not in totality or annularity?
The 2023 & 2024
Solar Eclipses
through the eyes of NASA
2023 Annular Solar Eclipse
2024 Total Solar Eclipse
2023 Path of Annularity October 14, 2023
2024 Path of Totality April 8, 2024
GLOBE EClipse



GLOBE Eclipse poster, available in the Resource Library.

GLOBE Eclipse: NASA Citizen Science for Everyone

observer.globe.gov/eclipse

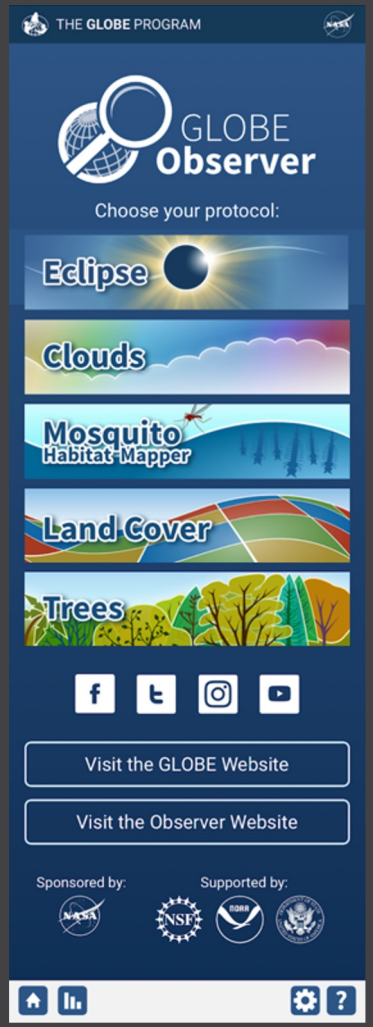
GLOBE Eclipse

Using the GLOBE Eclipse tool, volunteer scientists are able to:

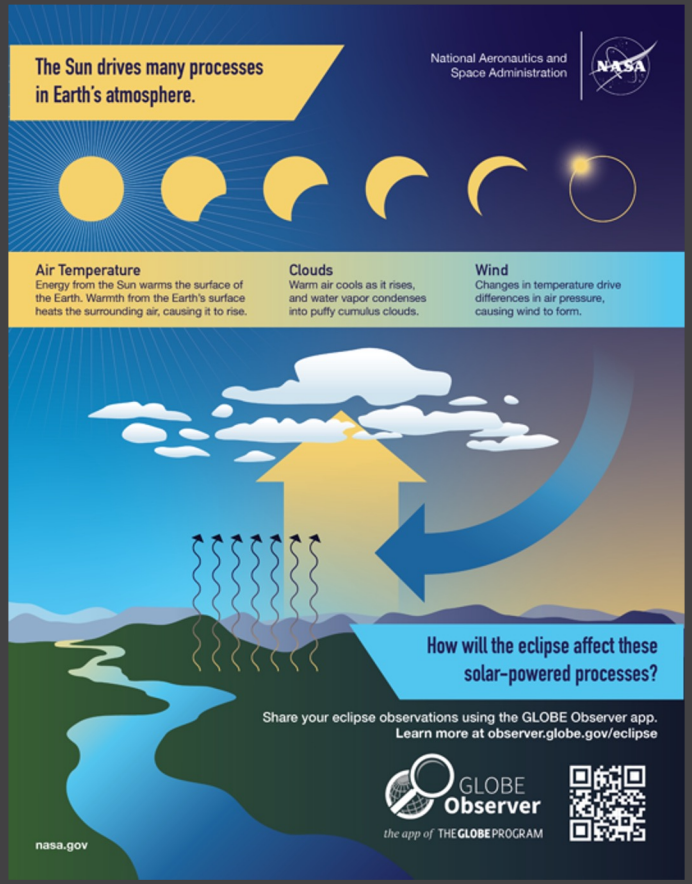
Observe how the eclipse changes atmospheric conditions near you by reporting on clouds and air temperature

Taking clouds observations using the Clouds tool, which is always available in the GLOBE Observer app, and is incorporated into the observation prompts for the Eclipse tool. Credit: GLOBE Clouds Team, NASA LaRC

Above: A simple thermometer that can be used to take air temperature measurements. Credit: GLOBE Observer team Right: An example of what the home screen of the GLOBE Observer app will look like when the Eclipse tool is available. Credits: GLOBE



The Earth Science Angle: Study eclipses as a volunteer observer with GLOBE

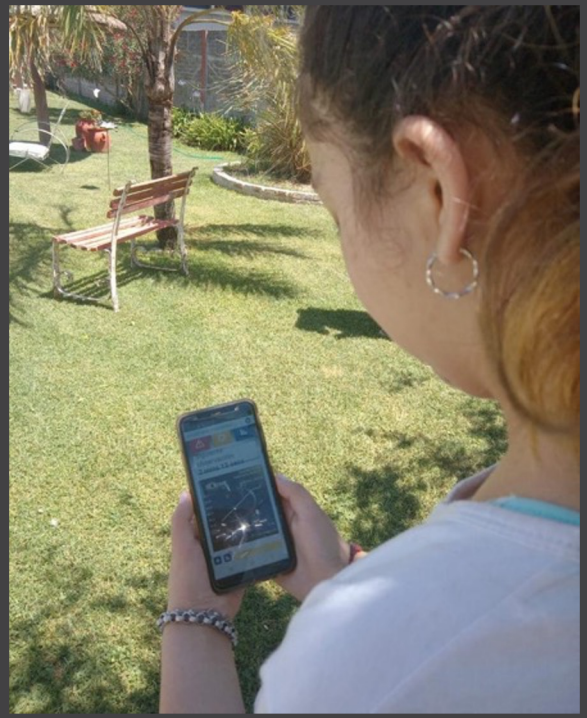


Energy from the Sun warms our planet, and changes in sunlight can also cause changes in temperature, clouds, and wind. What happens when the Sun is blocked by the Moon during an eclipse? How will the eclipse affect these solar-powered processes?

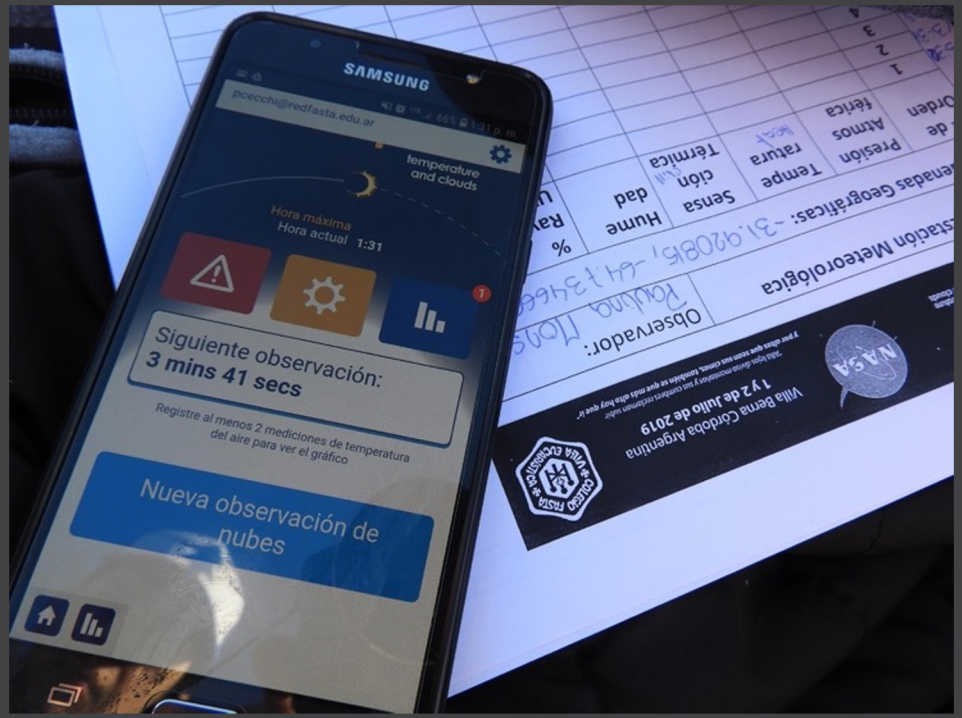
Diagram from the front side of a one-page document outlining the changes that might be observed during a solar eclipse, which is available on the GLOBE Observer Eclipse website.


GLOBE Observer
Provide comparison data even if not on the path of maximum eclipse
Eclipse shadow location is an estimation.
Air Temperature (°C)
-30 -10 0 10 20 30 40

Using the GLOBE Eclipse tool



Observer using the GLOBE Eclipse tool during the total eclipse in Argentina 14 Dec 2020. You can be offline during observations. Credit: Marta Kingsland



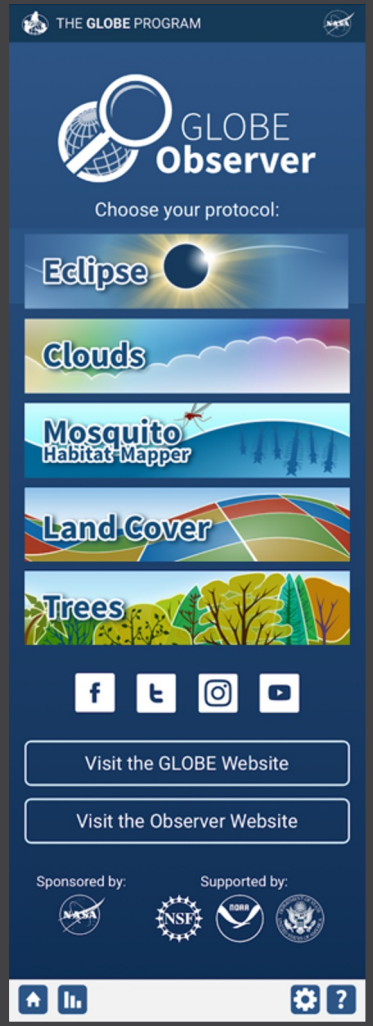
The app screen showing the countdown to the next observation, as well as an (optional) paper data sheet. Credit: Pablo Cecchi

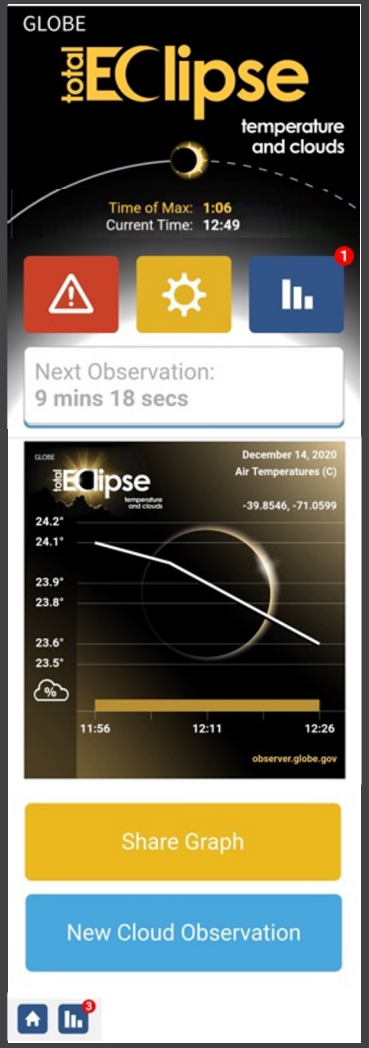
Supplies Required

- GLOBE Observer app: free on Google Play or in the App Store or paper data sheet (see observer.globe.gov/eclipse)
- Thermometer for measuring air temperature

Optional:

- Wind stick (you can make this!)
- Anemometer or weather station



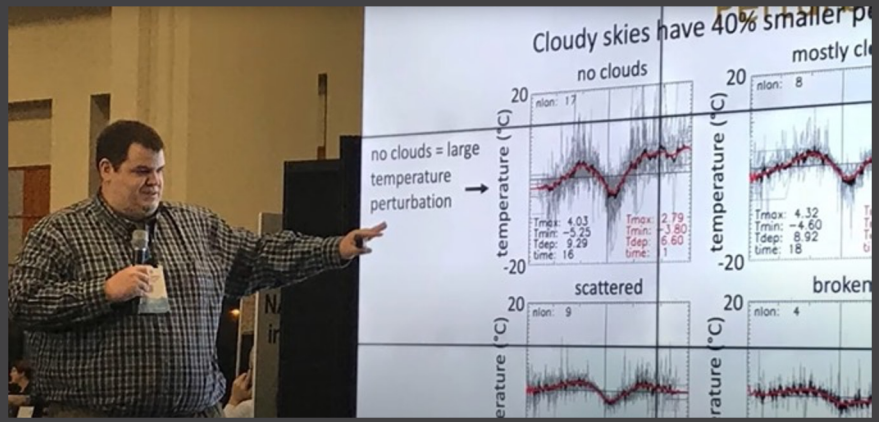


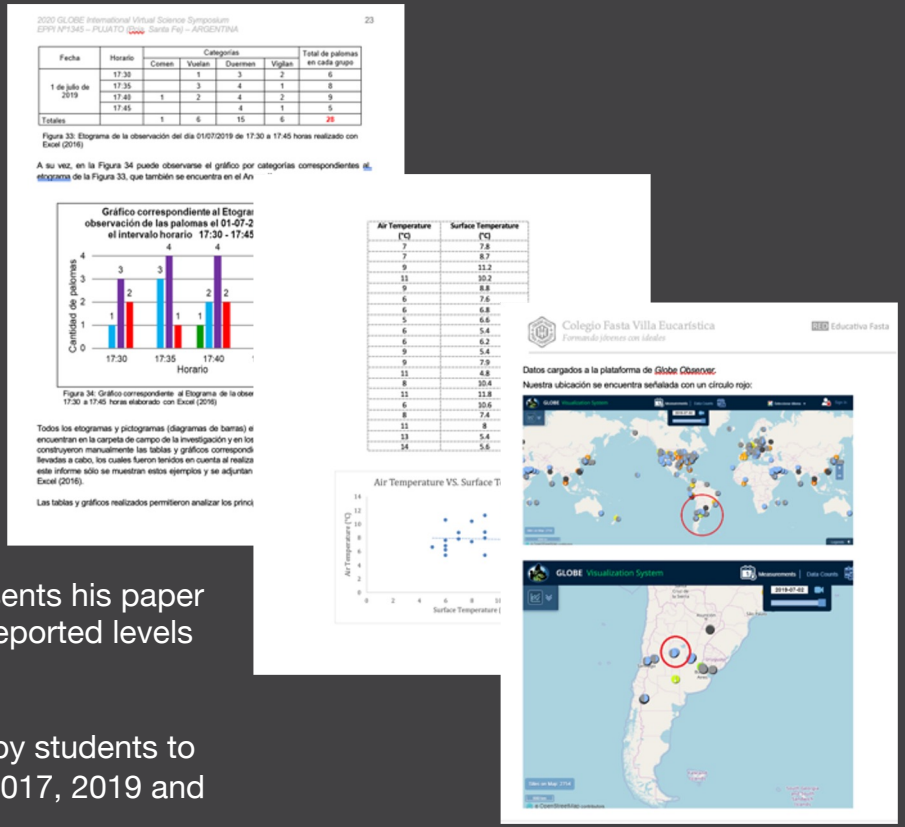
GLOBE Eclipse Overview

- Set up your site
- Report what is around you (land cover)
- Starting before first contact and through last contact, record the air temperature (every 5-10 minutes)
- Starting before first contact and through last contact photograph clouds when prompted (15-30 minutes), or when you see change
- Optional, photograph wind stick using land cover tool to report changes
- Submit data to GLOBE

Example thermometers. Credit: GLOBE
NOTE: A weather app does not count as “other” - you should have a separate physical thermometer.

- Contribute to a public database (GLOBE Program) used by scientists and students to study the effects of eclipses on the atmosphere





Left: Dr. Brant Dodson (NASA Langley Research Center) presents his paper comparing the citizen science temperature data at different reported levels of cloud cover, doi.org/10.1175/JAMC-D-18-0297.1

Right: Pages from several of the research reports submitted by students to the GLOBE International Virtual Science Symposia after the 2017, 2019 and 2020 eclipses, observer.globe.gov/eclipses#studentresearch

Find more details, including activity guides and extended opportunities for data collection, on the Eclipse page of the GLOBE Observer website, observer.globe.gov/eclipse

Questions?

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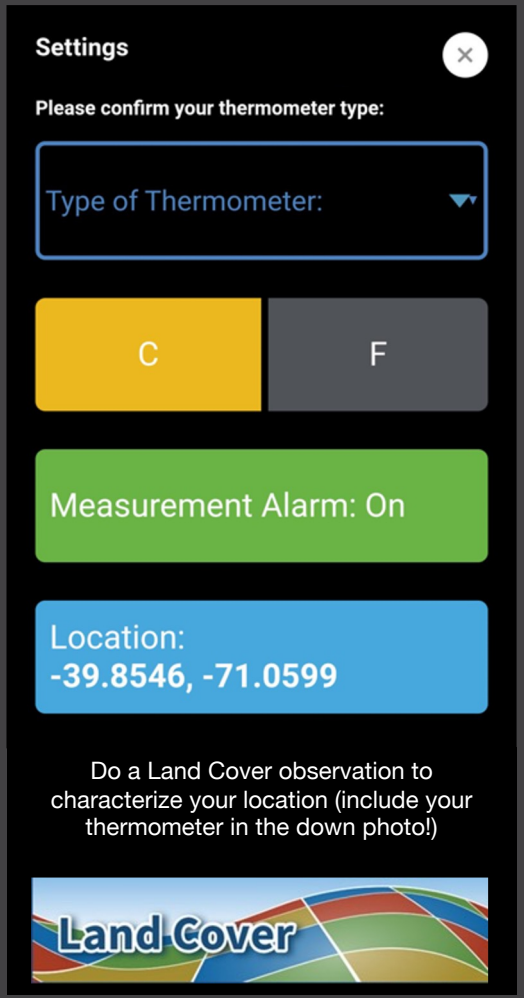
kristen.l.weaver@nasa.gov

GLOBE EClipse

GLOBE Eclipse Preparation

1. Download the GLOBE Observer app
2. Register for an account with an active email address
3. Take in-app training for clouds and land cover (less than 5 minutes)
4. Calibrate your thermometer by checking the temperature it records in an ice bath
5. Set up thermometer in a location that will be shaded during the eclipse
6. Optional: you could set up a GLOBE team so data collected by everyone at your observation site is collated in one location



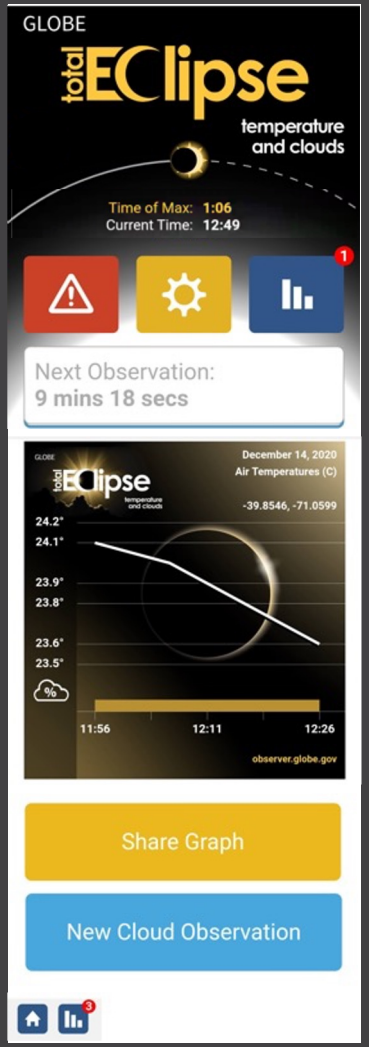
GLOBE Eclipse Starting your observations

Done once on site before the eclipse begins:

- Tell us what kind of thermometer you are using
- Choose Celsius or Fahrenheit
- Set alarm to notify you when to report temperature and clouds
- Set your location (fills in automatically, but can check accuracy
- Take a Land Cover observation to show us the observing site. This involves taking 6 photos (N, S, E, W, up and down). Include the wind stick in one photo if you are using it.

Example thermometers. Credit: GLOBE
NOTE: A weather app does not count as “other” - you should have a separate physical thermometer.

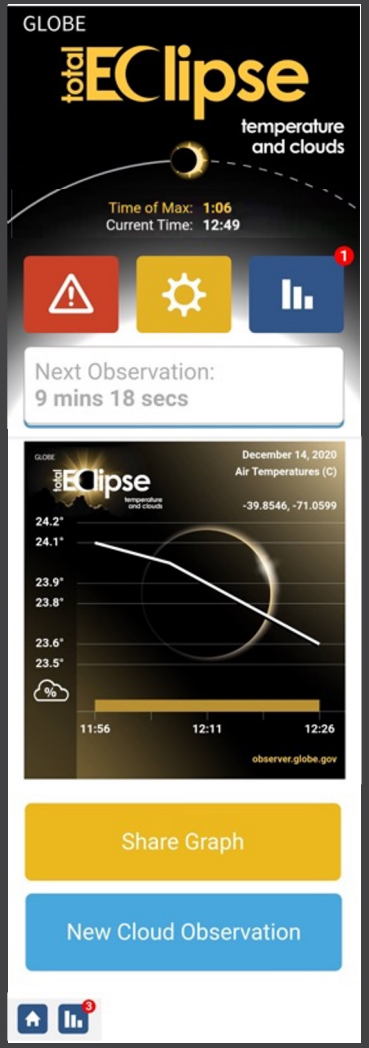
Using the App: Data Collection Screen

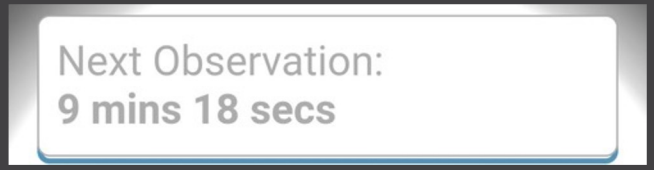


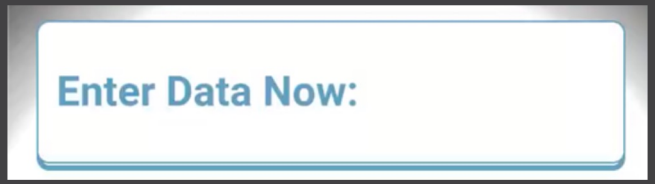
Top portion shows the time of maximum eclipse based on the current location

Buttons navigate to safety/intro pages, configuration/ settings (see previous slide), and a listing of the already collected data, respectively

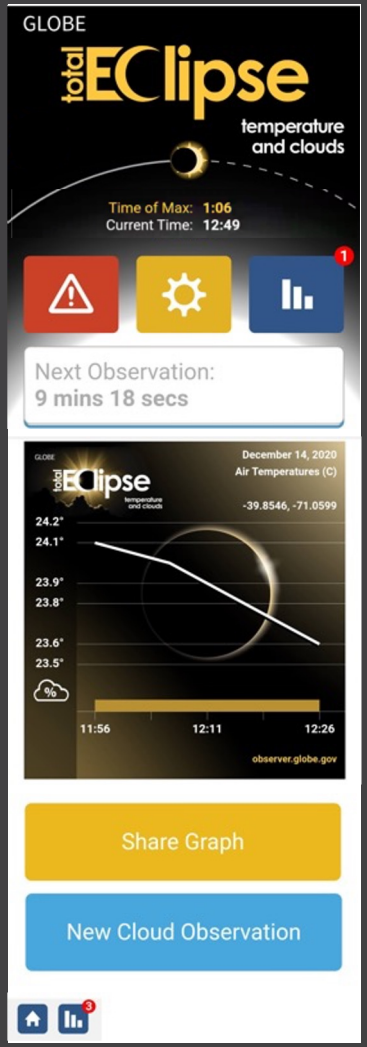
Using the App: Entering Temperature Data



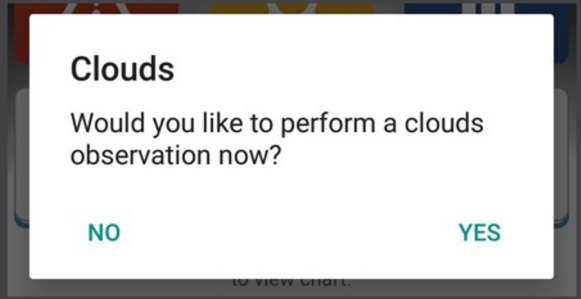


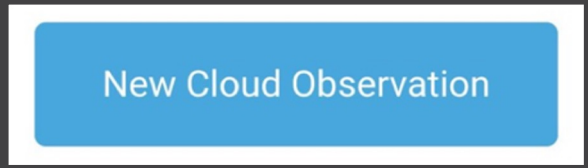


Display shows a countdown to the time for the next observation, or “Enter Data Now” when it’s time to collect another air temperature measurement. Tapping “Enter Data Now” brings up a selection menu for temperature values (right).



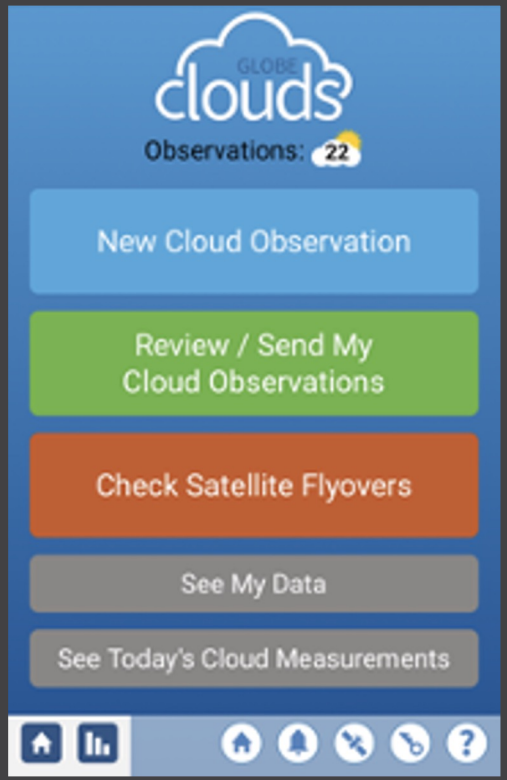
Using the App: Clouds Data





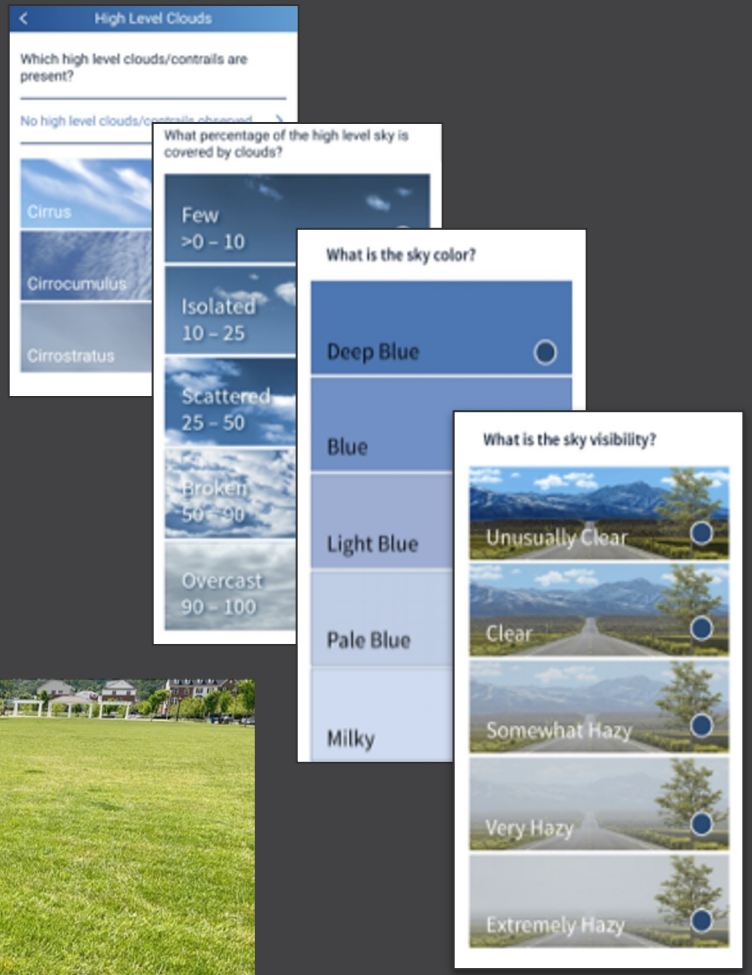
Periodically, the app will also pop up a reminder to take an observation of clouds, although users are also encouraged to take an observation at any time if they notice something changing in the cloud conditions (New Cloud Observation button).

Taking a Clouds Observation

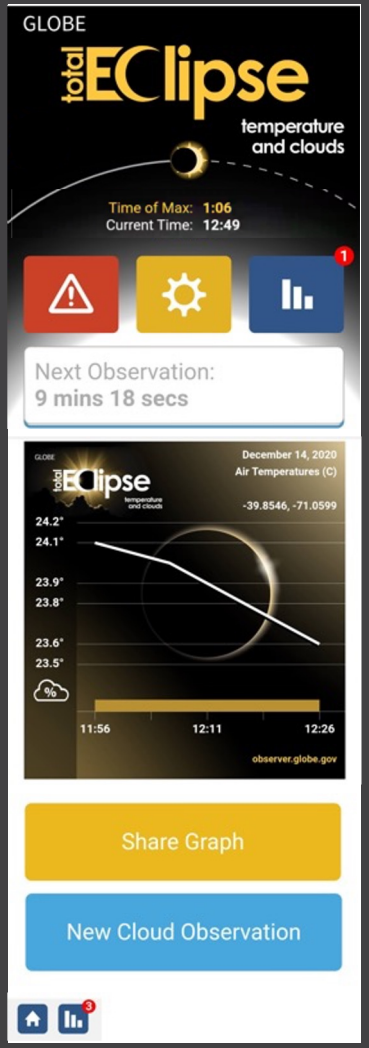


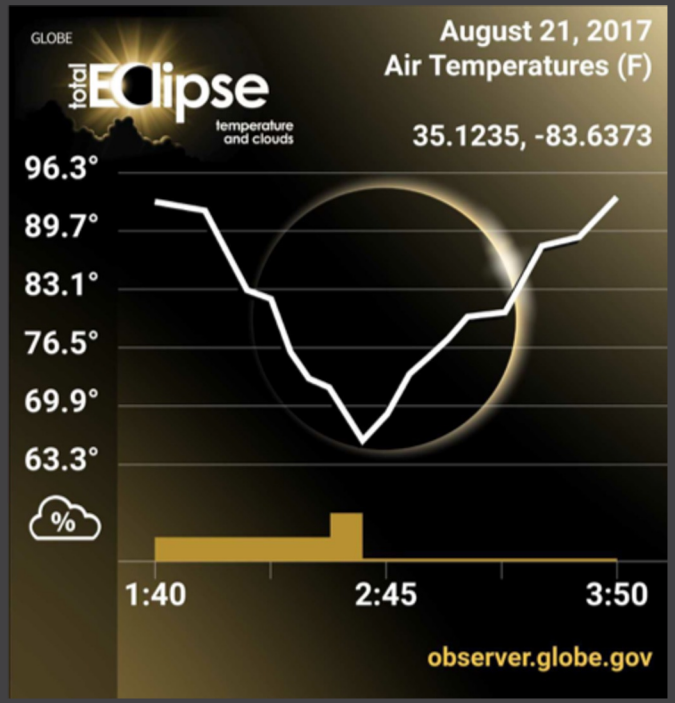
Steps to observe:

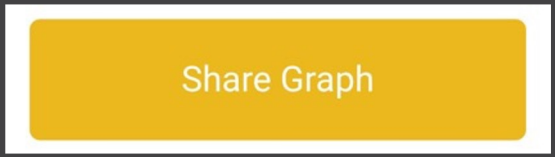
- Overall cloud cover
- Sky conditions
- Cloud types, cloud cover, and opacity by height
- Take photos



Using the App: Graphing the Data

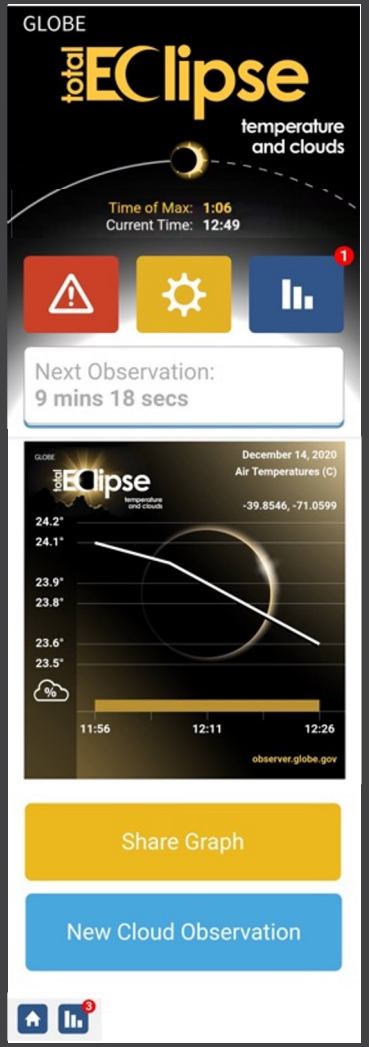




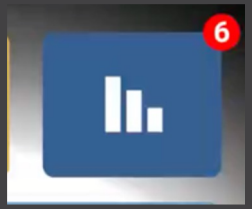


The graph will update as new data points are added, both for air temperature and overall cloud coverage.

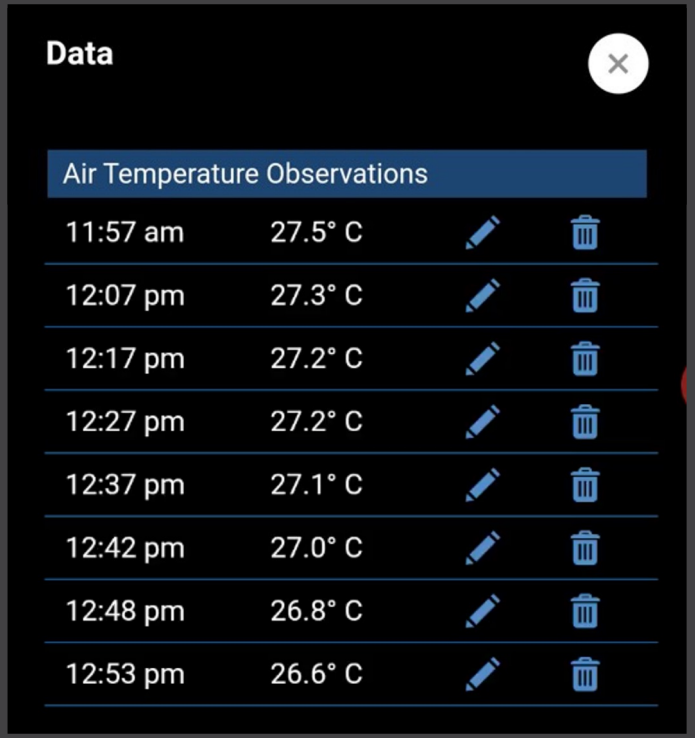
The ”Share Graph” button allows easy sharing to social media.



Using the App: Review/Edit Data



The graph icon goes to a listing of previously collected air temperature data, with options to edit or delete data points if needed.



Air Temperature Tips: Timing

- Ideally, take a measurement at least every ten minutes for two hours before and after maximum eclipse
- If you can, increase that to every five minutes for the half hour before and after totality or the maximum eclipse at your location.

Stop taking measurements during the maximum eclipse/totality to enjoy the experience!

Image of the solar corona taken in Argentina on 14 December 2020. Credit: Science Club Huechulafquen, Junín de los Andes, Argentina

- If you want the full temperature curve to appear in your graph, make sure you keep taking observations after the point of maximum eclipse.

Air Temperature Tips: Choosing a Thermometer

- Make sure you have a separate thermometer of some sort, whether digital or liquid-filled. Don't rely on a weather app on your phone, as that could be pulling data from a weather station some distance away.

Example thermometers.
Credit: GLOBE Observer team

- GLOBE has a list of equipment suppliers for North America, but many available thermometers are acceptable. Look for one with with an accuracy of +/- 0.5 °C (and 0.5 °C divisions for liquid filled models).

Air Temperature Tips: Accuracy of Measurements

- Using an instrument box is ideal, but if that isn't possible, make measurements in the shade (even your own shadow will help)

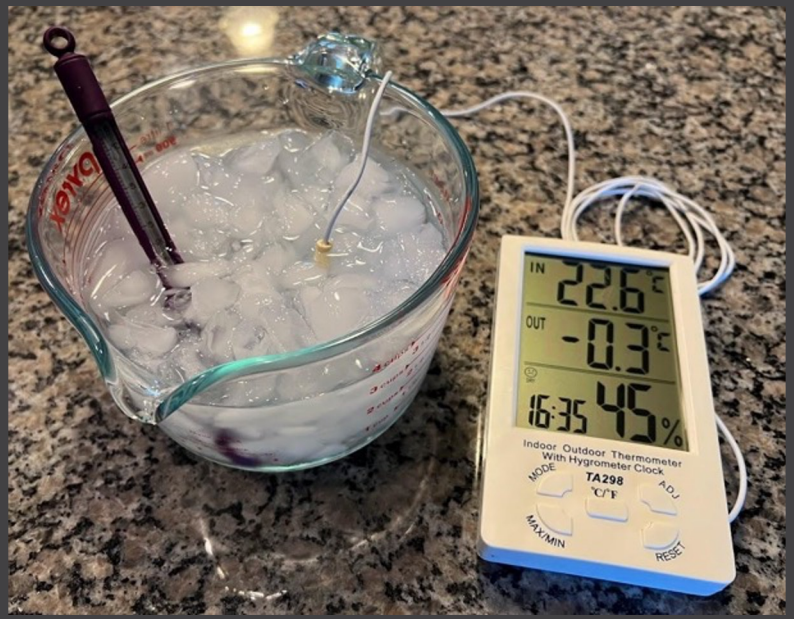
A mounted instrument box being checked by GLOBE students. Credit: GLOBE

Examples of taking the current temperature in the shade: Holding a simple liquid-filled thermometer in your shadow (left) or propping up a digital thermometer in a tree (right). Credit: GLOBE

Air Temperature Tips: Thermometer Calibration

For maximum accuracy, check the calibration of your thermometer.

- Prepare a mixture of fresh water and crushed ice with more ice than water in a container.
- Put the thermometer in the ice-water bath and let sit for about 10 minutes.
- Read the thermometer. If it reads between -0.5˚ C and +0.5˚ C, the thermometer is fine.



Testing the calibration of a liquid filled thermometer and a digital thermometer at the same time. Credit: GLOBE

Clouds Observations for the Eclipse

- Make observations about every 15-30 minutes, more often if you wish, especially any time you notice something changing.
- If you are also measuring air temperature, the eclipse tool will remind you with notifications to make your measurements about every third air temperature measurement.
- Feel free to add narrative comments to your photos about anything interesting you see happening.

Taking a Clouds observation with a mobile device. Credit: Lindsey Weaver

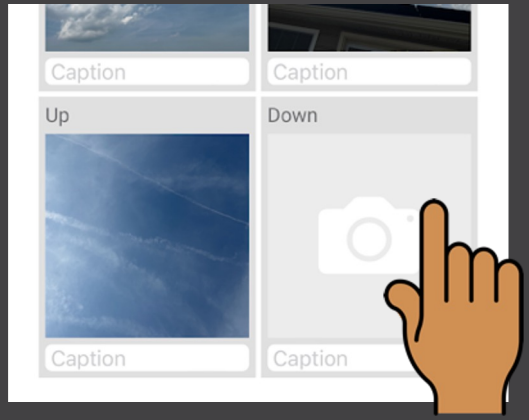
Students from Colegio Fasta Villa Eucarística, Córdoba, Argentina observing the July 2019 Eclipse. Credit: Pablo Cecchi

Basic Wind Observations

- A simple rod and a ribbon (a wind stick) can be a way to visually estimate if the wind is increasing or decreasing, or changing direction
- Include your stick in the down photo of any clouds observations you take to document the changes during the period of the eclipse.

Images of a wind stick showing progressively stronger wind from left to right.
Credit: AREN Project

Tip: Using the manual photo option for your down photo may make it easier to capture the wind stick fully.



Land Cover Observations

- We ask you do to a Land Cover observation as part of the initial setup when you open the Eclipse tool to help with research questions that may look at the effect of different types of surface cover on temperature changes during the eclipse.
- As part of that site setup, please include your thermometer in the down photo, which will allow us to confirm the type you are using for air temperature measurements.

A photo from a land cover observation. Credit: GLOBE

A person taking a land cover observation. Credit: GLOBE

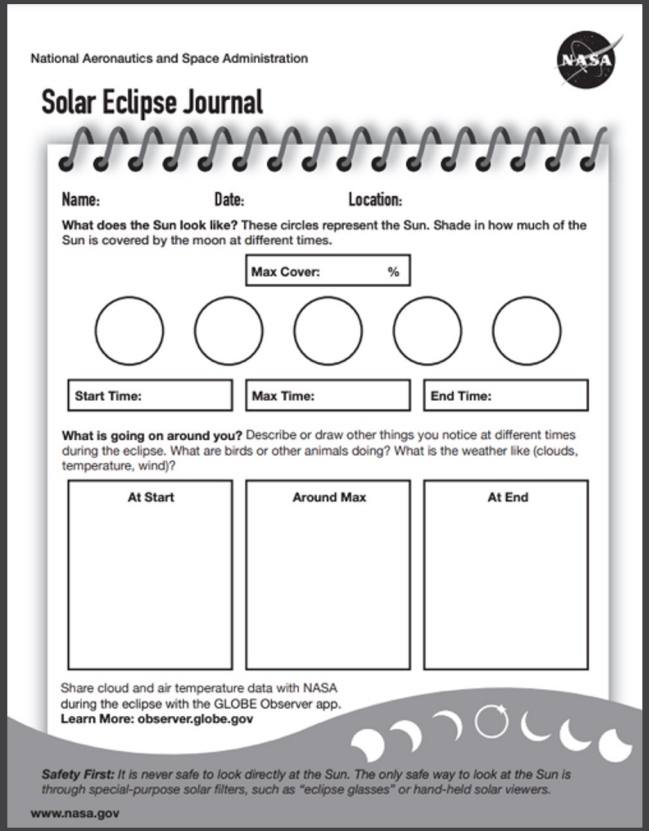
A digital thermometer included in the down photo of a land cover observation. Credit GLOBE

General Notes

- You should download the app and set up your account ahead of time, but you don’t need to have wifi or cellular signal to collect data (can collect and send later).
- Cloud and land cover observations are always available in the GLOBE Observer app, so you can practice those types of observations ahead of time. For basic app users, air temperature will become available closer to each eclipse.

Qualitative Observations

- In addition to adding narrative comments to the photos in a Clouds observation, or to the field notes in a Land Cover observation, we also have a paper Solar Eclipse Journal page available in the Eclipse Resource Library on the GLOBE Observer website.
- This can serve as an organizer for your thoughts or simply inspiration for creating your own style of eclipse journal page.



National Aeronautics and Space Administration

NASA

Solar Eclipse Journal

Name: Date: Location:

What does the Sun look like? These circles represent the Sun. Shade in how much of the Sun is covered by the moon at different times.

Max Cover: %

Start Time: | Max Time: | End Time:

What is going on around you? Describe or draw other things you notice at different times during the eclipse. What are birds or other animals doing? What is the weather like (clouds, temperature, wind)?

At Start	Around Max	At End

Share cloud and air temperature data with NASA during the eclipse with the GLOBE Observer app.
Learn More: observer.globe.gov

Safety First: *It is never safe to look directly at the Sun. The only safe way to look at the Sun is through special-purpose solar filters, such as "eclipse glasses" or hand-held solar viewers.*

www.nasa.gov