



GLOBE PROGRAM

A Worldwide Science and Education Program

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GLOBE Cup Challenge

During the World Cup, collect environmental data where the world plays soccer (football)! Learn more in an upcoming GO Connect webinar on 11 June.



The Beginning of GLOBE's surface temperature protocol: Southern Great Plains 1999 (SGP99) experiment

- Tested surface temperature and soil moisture remote sensing on aircraft and field observations
- Led to the SMAP satellite (Soil Moisture Active Passive)



Take Surface Temperature, Air Temperature, or Both

- Use an Infrared Thermometer for surface temperature
 - Etekcity or some other equivalent one
- Use an air temperature thermometer for air temperature



Leave the IRT outside for 1 hour if the outdoor temperature is much different than the indoor temperature.



How do I take my measurements?

HOW?

Hold your arm at arms length and point the instrument at the ground. After you pull the trigger then read the value including the tenths of a degree Celsius.



Photo credit: Kevin Czajkowski



Atmosphere



Surface Temperature

Caution!

Do not take the temperature of shadowed areas including the shadow that your body may cast.





Atmosphere



Surface Temperature

Caution!

Extend your arm in front of you to take the observations.
You don't want to measure the temperature of your feet.

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Take 3 - 9 random surface temperature readings within the homogeneous area





Caution! Do not mix cover types in one study area.





Air Temperature Observation Tips

When using an alcohol-filled or meat thermometer, check its calibration using an ice water slurry.





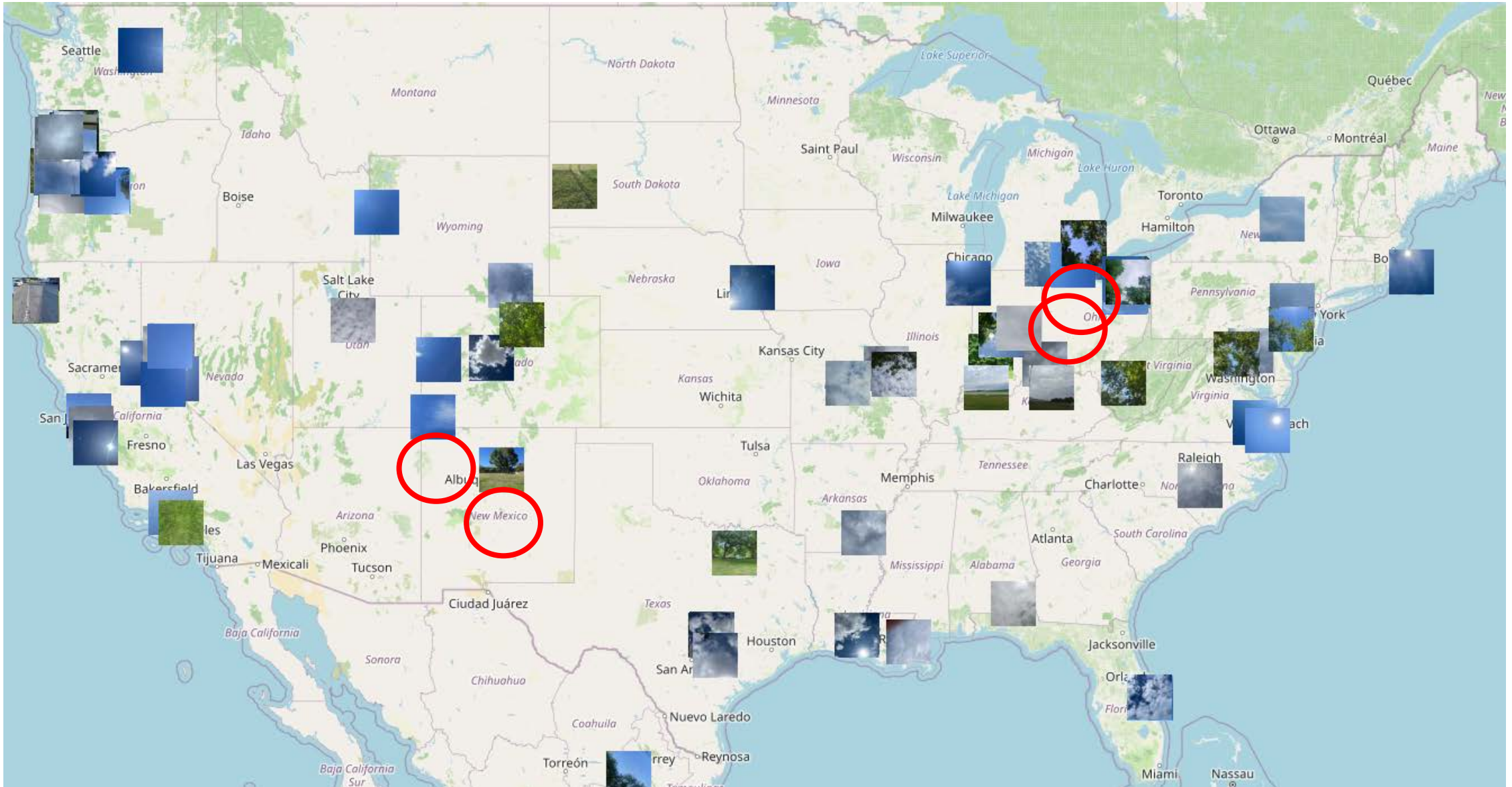
Air Temperature Observation Tips

Take the measurement in the shade
(could be in the shadow of your body)

Wait a minute to see if the temperature
changes – keep checking until the
temperature does not change



Soccer Fields I've Observed Recently



Ida Michigan – Grass – 20.1°C (68.0°F)



Cortez, Colorado – Grass – 26.9°C (80.4°F)



Grosse Ile, Michigan – Turf – 64.4°C (148.0°F)



Santa Fe, New Mexico – Irrigated Grass – 16.8°C (62.2°F)





Atmosphere



Surface Temperature

The steps below will walk you through entering your Atmosphere Study Site Information in the GLOBE Observer App, which you can access using your GLOBE or GLOBE Observer login.

1. Click “Data Entry”



2. Click "Create/Edit My Sites"





Atmosphere



Surface Temperature

3. Click on the arrow next to "Atmosphere" and select "*Surface Temperature*." The other necessary protocols will be automatically selected.

Select Protocols

▼ Atmosphere	1
☐ Aerosols	
☐ Air Temperature	
☐ Barometric Pressure	
☐ Clouds	
☐ Precipitation	
☐ Relative Humidity	
☒ Surface Temperature	
☐ Water Vapor	
☐ Wind	
* Required for one or more selected protocols	
► Biosphere	0
► Hydrosphere	0
► Pedosphere	0



Atmosphere



Surface Temperature

4. At the bottom of the screen, click “*Continue*”. When prompted, enter site location details (latitude, longitude, and elevation). Choose an existing site or identify a new site by clicking “+ *New Site Location*”

Site Location

Select your site from this list of sites shown on the map:

Select from all available sites. Narrow the list by typing into the search field.

Search Site Names

Show ten more ▼

+ New Site Location



5. When identifying a new site location, click on Surface Cover and choose which option best matches that which you are observing. Then, write in the site size of the location where the observation is taking place. To move on, click “*Next*.”

The image displays a sequence of three screenshots from a mobile application interface, illustrating the steps to identify a new site location.

First Screenshot (Left): The 'Site Location' screen shows the 'Review Site fields:' section. The 'Surface Temperature' section is active, and the 'Surface Cover' dropdown menu is open, showing a list of options. Below this, the 'Homogenous site sizes' section has buttons for '30m x 30m' and '90m x 90m'. A note states: 'If smaller than 30m x 30m, enter size below'. The 'Short Side:' and 'Long Side:' fields are visible, with 'Short Side:' currently set to '30m'. The 'IRT Instrument Type' section shows 'Use Raytech ST20'. A 'Next' button is at the bottom.

Second Screenshot (Middle): This is a close-up of the 'Surface Cover' dropdown menu, showing a list of options: Open water, Peat, Permafrost, Permeable pavers, Rocks, Roof, Sand, Short grass, Tall grass, Snow/Ice, and Other. Each option has a radio button next to it.

Third Screenshot (Right): The 'Site Location' screen shows the 'Review Site fields:' section. The 'Surface Temperature' section is active, and the 'Surface Cover' dropdown menu is open, showing a list of options. Below this, the 'Homogenous site sizes' section has buttons for '30m x 30m' and '90m x 90m'. A note states: 'If smaller than 30m x 30m, enter size below'. The 'Short Side:' and 'Long Side:' fields are visible, with 'Short Side:' currently set to '30m'. The 'IRT Instrument Type' section shows 'Use Raytech ST20'. A 'Next' button is at the bottom.



Atmosphere



Surface Temperature

6. Check to see if the “*Date and Time*” are correct, if it is not, click “*Get Current Time*” to update it. Then click “*Surface Temperature*” to move on.

< Date and Time

Enter the local date and time of the observation:

Local Date:
2025-11-12

Local Time (24hr):
05:54:00

Get Current Time

Observation Date:
2025-11-12 UTC

Observation Time:
10:54 UTC

Solar Noon:
16:39 UTC

Surface Temperature

20



7. Now you will put in some information about your observation. “Click on **Overall Surface Condition**” to select from “*Wet*,” “*Dry*,” “*Snow*.” If selecting “*Snow*,” report snow depth too (in millimeters). **Be sure to report surface temperature using Celsius/ °C in your measurements.** Click “*Review*” when done.

Surface Temperature

Overall Surface Condition *

Temperature Measurements

Sample #1

Surface Temperature *

+ Add Sample #2

Comments:

Review

Surface Temperature

Overall Surface Condition *

Temperature Measurements

Sample #1

Wet

Dry

Snow

Review

Surface Temperature

Overall Surface Condition *

Snow

Temperature Measurements

Sample #1

Surface Temperature *

Snow Depth *

mm *

+ Add Sample #2

Comments:

Review



The steps below will walk you through entering your Atmosphere Study Site Information in the GLOBE Observer App, which you can access using your GLOBE or GLOBE Observer login.

1. Click “Data Entry”



2. Click "Create/Edit My Sites"





3. Click on the arrow next to "Atmosphere" and select "Air Temperature"

Select Protocols

▼ Atmosphere	1
☐ Aerosols	
☒ Air Temperature	
☐ Barometric Pressure	
☐ Clouds	
☐ Precipitation	
☐ Relative Humidity	
☐ Surface Temperature	
☐ Water Vapor	
☐ Wind	
★ Required for one or more selected protocols	
► Biosphere	0
► Hydrosphere	0
► Pedosphere	0

Navigation icons: Home, Bar Chart, Help, and Home.



4. At the bottom of the screen, click “*Continue*”. When prompted, enter site location details (latitude, longitude, and elevation). Choose an existing site or identify a new site by clicking “+ *New Site Location*”

Site Location

Select your site from this list of sites shown on the map:

Select from all available sites. Narrow the list by typing into the search field.

Search Site Names

Show ten more

+ New Site Location



5) Select *Thermometer Type*.

A screenshot of a mobile application interface showing a list of thermometer types. The list is displayed on a dark background with white text. Each item has a radio button to its right. The first item, 'Other, Soil or Air', is selected, indicated by a blue dot in its radio button. The other items are 'Liquid-Filled, Current Temp Only', 'Digital Single-Day Max/Min', 'Digital Multi-Day Max/Min', 'Earth Networks Station', 'Davis Instrument', 'Data Logger (HOBO)', 'Rainwise', 'Weatherhawk', and 'UCAR 3D-PAWS'.

Thermometer Type	Selected
Other, Soil or Air	☒
Liquid-Filled, Current Temp Only	☐
Digital Single-Day Max/Min	☐
Digital Multi-Day Max/Min	☐
Earth Networks Station	☐
Davis Instrument	☐
Data Logger (HOBO)	☐
Rainwise	☐
Weatherhawk	☐
UCAR 3D-PAWS	☐

6) Enter *Thermometer Height* (cm) and be sure to note any obstacles or buildings near the thermometers. Select the type of surface cover (artificial turf, asphalt, concrete, etc.)

A screenshot of a mobile application interface showing the 'Air Temperature' section. The section is titled 'Air Temperature' in a dark blue header. Below the header, there are several input fields: 'Thermometer Type' (a dropdown menu with a red asterisk indicating a required field), 'Thermometer Height (cm)' (a text input field), 'Obstacles' (a text input field), 'Buildings' (a text input field), and 'Surface Cover' (a dropdown menu). At the bottom of the section is a 'Next' button.

Field	Type
Thermometer Type	Dropdown
Thermometer Height (cm)	Text Input
Obstacles	Text Input
Buildings	Text Input
Surface Cover	Dropdown
Next	Button



7) Enter the *Current Temperature* (°C). Document site conditions, timing, and any other information about the site or air temperature measurement clearly using the "*Comments*" section.

 Air Temperature

Current Temperature (Celsius) *

range -65 to 55

Comments

Review