


# GLOBE ECSU Hybrid Training

 **THE GLOBE PROGRAM**  
A Worldwide Science and Education Program


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**Ms. Jessica Taylor**  
GLOBE Training Point of Contact  
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Account Status:  
GLOBE Member

Training Status:  
Trained

User Type:  
Master Trainer  
Partner  
Teacher  
Trainer  
Blogger

Jessica Taylor is a Physical Scientist at NASA's Langley Research Center. She serves as Lead trainer for the GLOBE Atmosphere Training Center of Excellence and is the Education and Public Outreach lead for the CALIPSO mission. Jessica serves Chair for the GLOBE Education Working Group.

Jessica's participation in GLOBE began in 2001 at Florida State University where she took regular atmosphere measurements and trained teachers through their Partnership. Now at NASA, Jessica coordinates GLOBE Workshops as integrated outreach efforts for several NASA Missions including CALIPSO, DISCOVER-AQ, SEAC4RS, and SAGE III on ISS. She recently served on several GLOBE committees including: GLOBE Atmosphere Refresh Panel, GLOBE Virtual Training Committee, and Student Climate Research Campaign Phase 2 Advisory Committee. She participated in the GLOBE/NGSS collaborations and the GLOBE Annual 2013 Meeting Planning Committee.

Jessica has worked in various formal and informal science education programs including: EXPLORES!, a satellite education

Number of my students using GLOBE this year: **50** [Edit](#)

RecognitionProtocols and Activities Used

GLOBE Member Recognition

1 YEAR	5 YEARS	10 YEARS	15 YEARS
2002	2006	2011	2016

Member Location

NASA Langley Research Center

MapSatelliteW Bush Rd

With GLOBE Master Trainer, Jessica Taylor from NASA Langley

[Jessica.e.taylor@nasa.gov](mailto:Jessica.e.taylor@nasa.gov)

[help@globe.gov](mailto:help@globe.gov)

# Pre-requisite Online Materials

K-5 Teachers	6-8 Teachers	9-12 Teachers	Pre-Service Teachers (ECSU Students)
Register for GLOBE Workshop and Create GLOBE Teacher Account at: <a href="https://www.globe.gov/get-trained/workshops">https://www.globe.gov/get-trained/workshops</a>	Register for GLOBE Workshop and Create GLOBE Teacher Account at: <a href="https://www.globe.gov/get-trained/workshops">https://www.globe.gov/get-trained/workshops</a>	Register for GLOBE Workshop and Create GLOBE Teacher Account at: <a href="https://www.globe.gov/get-trained/workshops">https://www.globe.gov/get-trained/workshops</a>	Register for GLOBE Workshop and Create GLOBE Teacher Account at: <a href="https://www.globe.gov/get-trained/workshops">https://www.globe.gov/get-trained/workshops</a>
Conduct online GLOBE eTraining at: <a href="http://www.globe.gov/get-trained/protocol-ettraining">http://www.globe.gov/get-trained/protocol-ettraining</a>	Conduct online GLOBE eTraining at: <a href="http://www.globe.gov/get-trained/protocol-ettraining">http://www.globe.gov/get-trained/protocol-ettraining</a>	Conduct online GLOBE eTraining at: <a href="http://www.globe.gov/get-trained/protocol-ettraining">http://www.globe.gov/get-trained/protocol-ettraining</a>	Conduct online GLOBE eTraining at: <a href="http://www.globe.gov/get-trained/protocol-ettraining">http://www.globe.gov/get-trained/protocol-ettraining</a>
• Introduction to GLOBE	• Introduction to GLOBE	• Introduction to GLOBE	• Introduction to GLOBE
• Introduction to Atmosphere	• Introduction to Atmosphere	• Introduction to Atmosphere	• Introduction to Atmosphere
• Clouds	• Clouds	• Clouds	• Clouds
• Surface Temperature	• Surface Temperature	• Surface Temperature	• Surface Temperature
Review Elementary GLOBE Teacher Implementation Guide: <a href="http://www.globe.gov/documents/348830/348842/ElementaryGLOBEImplementationGuide_en.pdf">http://www.globe.gov/documents/348830/348842/ElementaryGLOBEImplementationGuide_en.pdf</a>	• Air Temperature	• Air Temperature	• Air Temperature
Read Elementary GLOBE Aerosols Storybook: <a href="http://www.globe.gov/web/elementary-globe/overview/aerosols/story-book">http://www.globe.gov/web/elementary-globe/overview/aerosols/story-book</a>	Read Dr. C's latest blog post on Urban Heat Islands and his Surface Temperature Measurement Campaign: <a href="http://bit.ly/2hnbLOs">http://bit.ly/2hnbLOs</a>	Read Dr. C's latest blog post on Urban Heat Islands and his Surface Temperature Measurement Campaign: <a href="http://bit.ly/2hnbLOs">http://bit.ly/2hnbLOs</a>	Read Elementary GLOBE Aerosols Storybook: <a href="http://www.globe.gov/web/elementary-globe/overview/aerosols/story-book">http://www.globe.gov/web/elementary-globe/overview/aerosols/story-book</a>
Review Elementary GLOBE Aerosols Learning Activities: <a href="http://www.globe.gov/web/elementary-globe/overview/aerosols/learning-activities">http://www.globe.gov/web/elementary-globe/overview/aerosols/learning-activities</a>	Watch Recorded Webinar on Field Investigations, helping students and teachers prepare for the GLOBE Science Symposium: <a href="https://www.globe.gov/web/united-states-of-america/events/eventsdetail/14718/teacher-pd-webinar-conducting-field-investigatio-1">https://www.globe.gov/web/united-states-of-america/events/eventsdetail/14718/teacher-pd-webinar-conducting-field-investigatio-1</a>	Watch Recorded Webinar on Field Investigations, helping students and teachers prepare for the GLOBE Science Symposium: <a href="https://www.globe.gov/web/united-states-of-america/events/eventsdetail/14718/teacher-pd-webinar-conducting-field-investigatio-1">https://www.globe.gov/web/united-states-of-america/events/eventsdetail/14718/teacher-pd-webinar-conducting-field-investigatio-1</a>	Watch Recorded Webinar on Field Investigations, helping students and teachers prepare for the GLOBE Science Symposium: <a href="https://www.globe.gov/web/united-states-of-america/events/eventsdetail/14718/teacher-pd-webinar-conducting-field-investigatio-1">https://www.globe.gov/web/united-states-of-america/events/eventsdetail/14718/teacher-pd-webinar-conducting-field-investigatio-1</a>

# Agenda ECSU F2F Training

**9:00**

Welcome

*Microclimates* Activity

**10:00**

Watch SAGE Launch, live

GLOBE Student Research Process

Observations, Questions, Protocols

**11:00**

Instrument Shelter Set-Up

Review Air Temperature

Calibrating your Thermometer

**11:30 Lunch**

**12:00**

Review Surface Temperature

Review Clouds – Cloud Triangle

Outside Data Collection (Paper Data  
Sheets, Apps)

Review and Analyze our Data

Enter Data on GLOBE site

**1:00**

Learning Activity – *Earth System  
Satellite Images*

Discuss GLOBE across grade bands

Wrap – up and Certificates

Saturday, February 18, 2017

# Welcome & Introductions

Please share

- Your name
- Your school – grade you teach or what you want to teach
- 1 thing you learned from online materials
- 1 thing you have questions about, or want to know more about

# Global Learning and Observations to Benefit the Environment

## *Vision:*

- *A worldwide community of students, teachers, scientists, and citizens working together to better understand, sustain, and improve Earth's environment at local, regional, and global scales.*

## *Mission:*

- *To promote the teaching and learning of science, enhance environmental literacy and stewardship, and promote scientific discovery.*



# Timeout for: SAGE Launch!

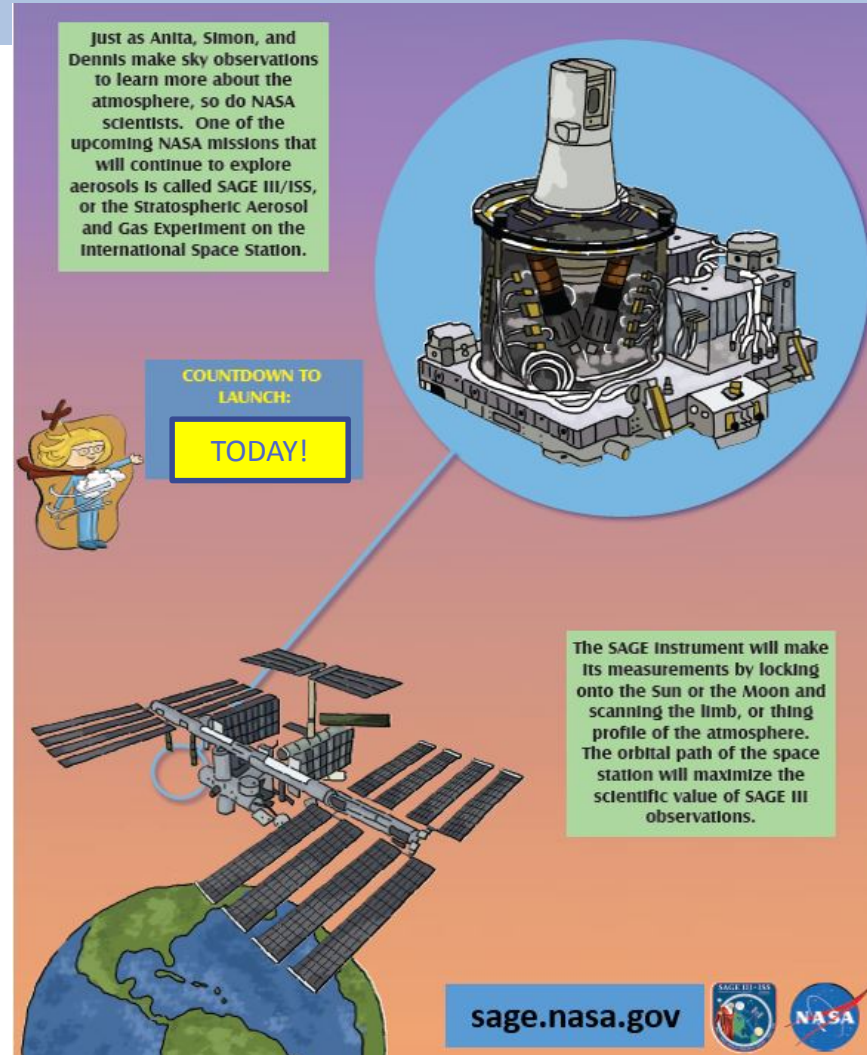
- View Launch Live on NASA TV:  
<https://www.nasa.gov/multimedia/nasatv/index.html#public>

Just as Anita, Simon, and Dennis make sky observations to learn more about the atmosphere, so do NASA scientists. One of the upcoming NASA missions that will continue to explore aerosols is called SAGE III/ISS, or the Stratospheric Aerosol and Gas Experiment on the International Space Station.

COUNTDOWN TO LAUNCH:  
**TODAY!**

The SAGE Instrument will make its measurements by locking onto the Sun or the Moon and scanning the limb, or thing profile of the atmosphere. The orbital path of the space station will maximize the scientific value of SAGE III observations.

[sage.nasa.gov](https://sage.nasa.gov)



The illustration features a cartoon character with blonde hair and a red bow, holding a clipboard and pointing towards the SAGE III instrument. The instrument is shown in a circular inset, highlighting its complex structure with various sensors and antennas. Below, the International Space Station is depicted in orbit over a stylized Earth, with a line connecting it to the instrument inset. The background is a gradient of purple and blue.

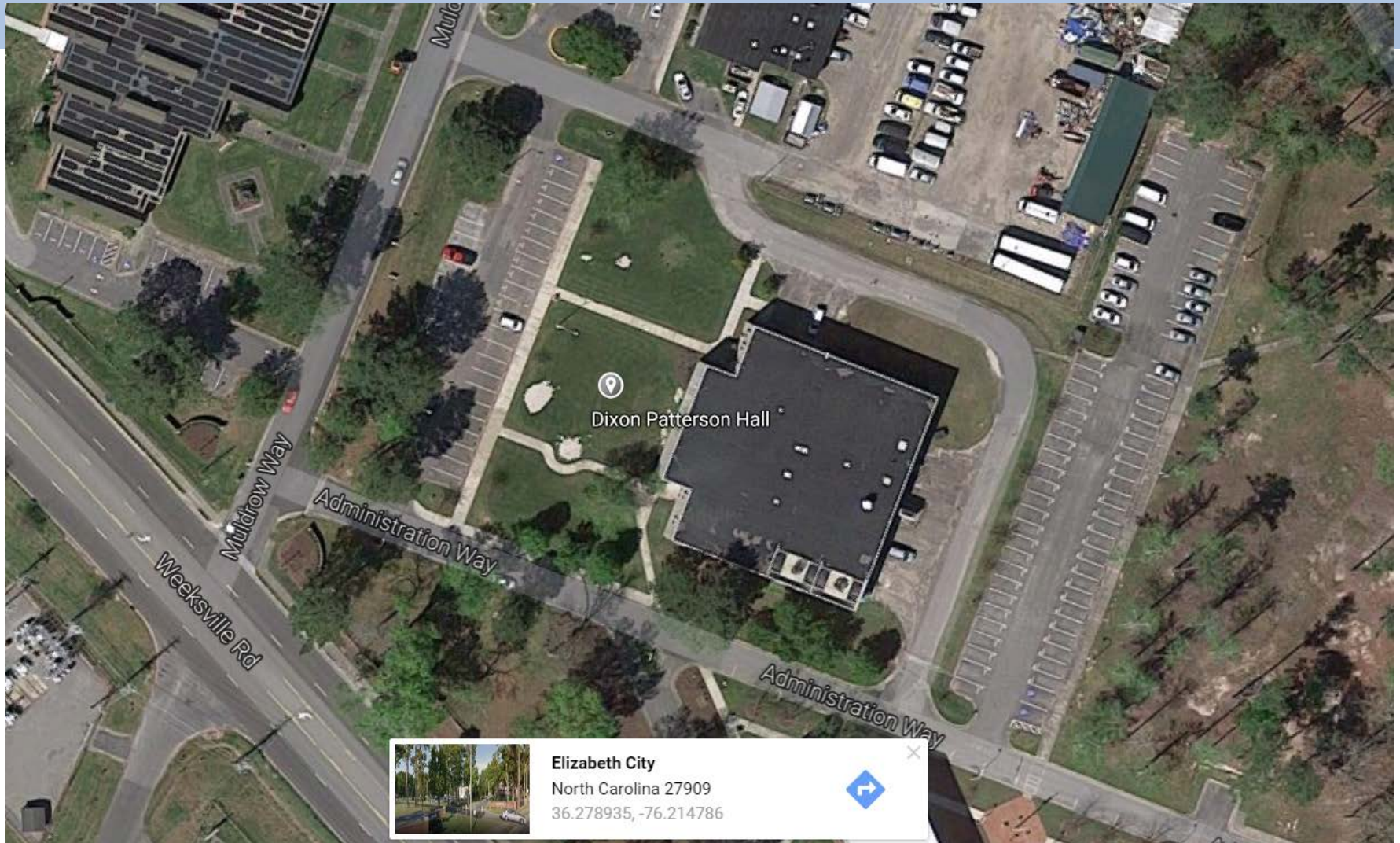
[https://www.globe.gov/c/blogs/find\\_entry?entryId=23154545](https://www.globe.gov/c/blogs/find_entry?entryId=23154545)



# *Microclimates Activity*

- A microclimate is a local atmospheric zone where the climate differs from the surrounding area. The term may refer to areas as small as a few square meters (for example a garden bed) or as large as many square kilometers (for example a small town).
- Microclimates exist, for example, near bodies of water which may cool the local atmosphere, or in heavily urban areas where brick, concrete, and asphalt absorb the sun's energy, heat up, and re-radiate that heat to the ambient air; the resulting urban heat island is a kind of microclimate.
- Another contributing factor to a microclimate is the slope or aspect of an area. South-facing slopes in the Northern Hemisphere and north-facing slopes in the Southern Hemisphere are exposed to more direct sunlight than opposite slopes and are therefore warmer for longer periods of time.
- Some cities or large areas are renowned for their microclimates and may have a wide range of extremes of temperature due to the influence of physical factors.

# Task 1: Sketch Grounds



From GLOBE's What is Your Climate Classification Climate Foundations Activity  
[http://classic.globe.gov/fsl/pdf/2011/What\\_Is\\_Your\\_Climate\\_Classification.pdf](http://classic.globe.gov/fsl/pdf/2011/What_Is_Your_Climate_Classification.pdf)



# Task 2: Factors that affect Temperature

Describe Factor (i.e. grass surface, brick building close)	Impact on Temperature +, -, =, or ?

# Task 3: Select Comparison Locations

- Identify comparison areas on sketch
- Predict temperature differences

How will the air temperature in each area compare? Why?

# Task 4: (OUTSIDE)

## Document Sites & Measure Temperature

Date of Observation:			
Area	Record Area Observations (i.e. patchy grass, plant species)	Air Temperature	Other Important Details

# Task 5: Compare & Analyze

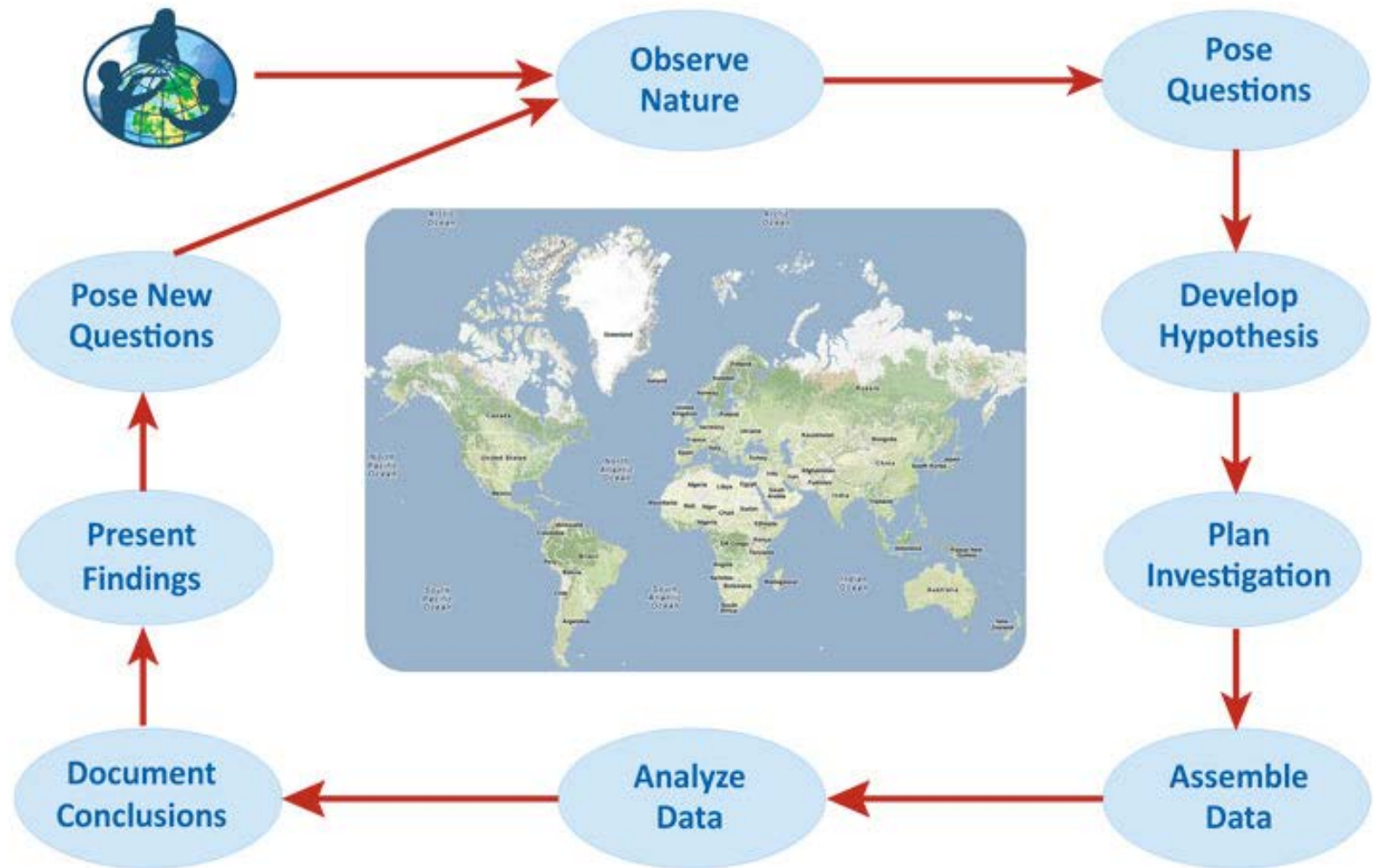
Did your predictions on the microclimate of the two areas you selected match with your observations?

Provide possible explanations.

What other factors could affect air temperature?



# Scientific Research Process



# Observations

- How do we make “observations”?
- What’s so important about making observations?
- What makes it challenging?



# Another Example: Making Observations

Using a science notebook, let's document our environment

- Both drawings and descriptive words

*What questions do you have based on your observations?*

The Mystery of the Missing Hummingbirds

**All Year Long Student Activity Sheet 2**

Name \_\_\_\_\_

Date \_\_\_\_\_

Weather \_\_\_\_\_

Temperature ☐ Hot ☐ Warm ☐ Cool ☐ Cold

**Big Picture View**  
Write or draw your observations here.

From Elementary GLOBE “All Year Long” Activity

<https://www.globe.gov/web/elementary-globe/overview/seasons/learning-activities>

# Questions vs Research Questions

Research Question Characteristics Worksheet	Points (0 or 1)
The answer is not immediately obvious	
There could be more than one answer - the answer is not just yes or no	
Encourages a new or different view of phenomena	
Narrow in focus so that the necessary research can be done	
Clear enough for other people to understand	
Tests an accepted explanation	
Completes or adapts an existing explanation	
Goes beyond existing explanations	
Possible to answer in the time available to you	
Possible to answer with measurement equipment and techniques available to you	
Any data required from others is available or can be obtained through collaboration	
Will sustain your interest for the time required to complete the research	
Tests your assumptions about the phenomenon	
<b>Total Points</b>	



# Making Measurements Count

**What non-environmental factors might influence our measurements?**

Let's look at current temperature across various instruments...

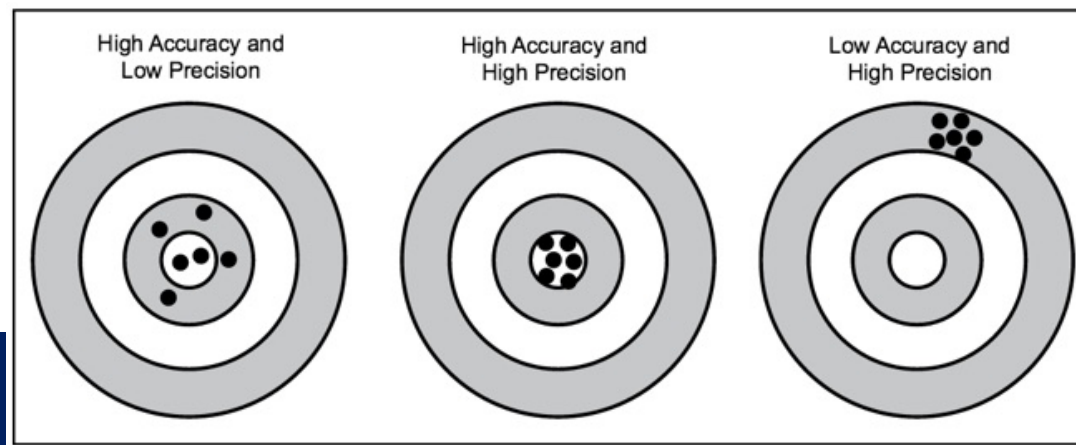
*What value would we report to GLOBE? How do we know if the measurements are accurate?*

# Making Measurements Count

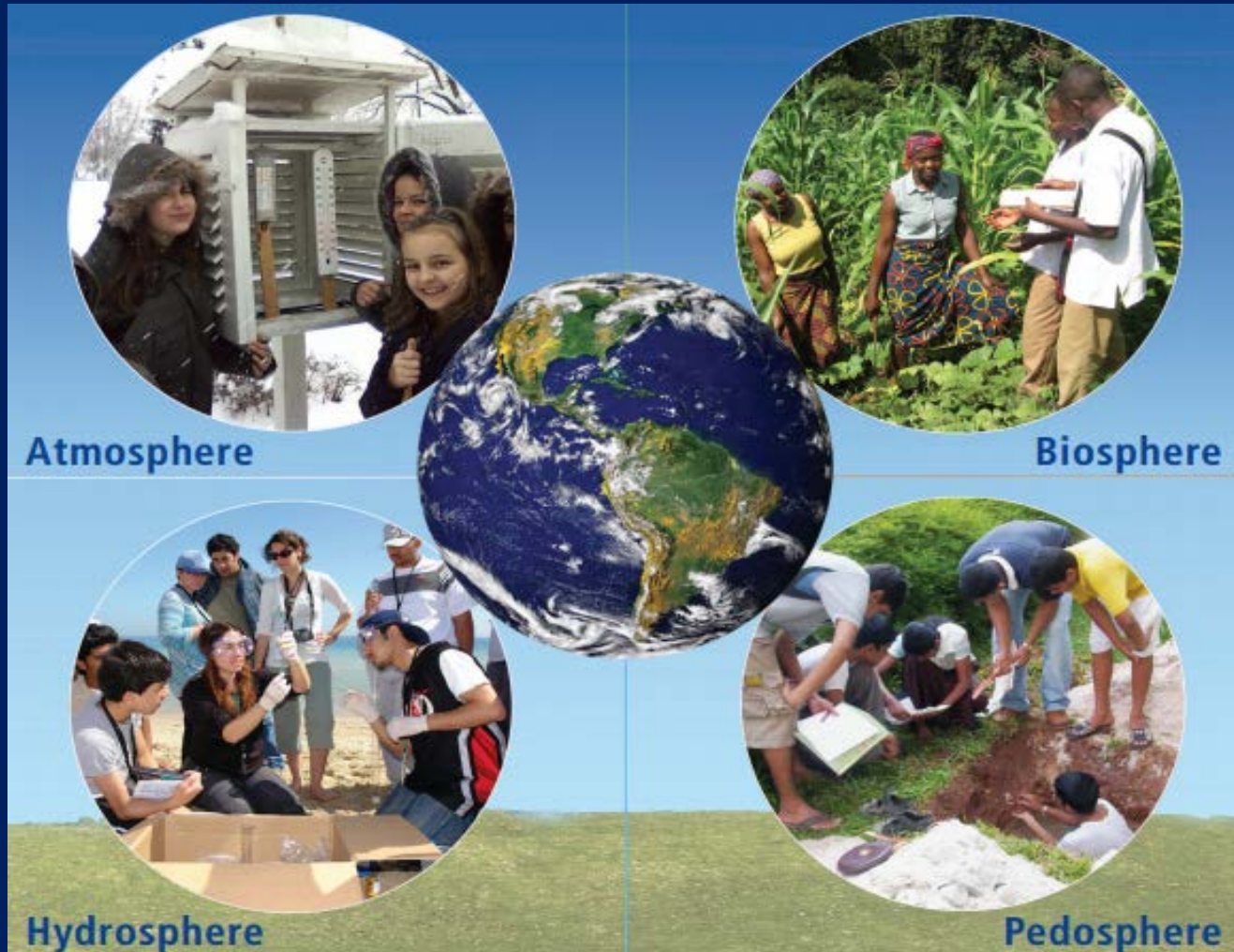
**Accuracy** is a measure of how well the data describe a phenomenon. We make sure our instruments are accurate by calibrating them.

**Precision** is demonstrated when repeated measurements yield the same outcome. In most GLOBE protocols, you are asked to take a measurement multiple times – allowing for you – as well as other scientists – to determine the precision of your data.

GLOBE **Protocols** provide steps and procedures for collecting data.



# GLOBE Science Investigation Protocols



# Instrument Shelter

- Locate away from obstacles
- Place over natural surface
- Shelter should face away from the equator
- Temperature sensor should be 1.5 m above the ground
- After set-up, complete the site definition



Recommended Activity, Studying the Instrument Shelter

<https://www.globe.gov/documents/348614/5910806d-1243-4ba3-95cd-87550a7e54a3>



# Temperature with Instrument Shelter

## Instruments

- Digital Mult-Day Max/Min
- Need Calibration
- Thermometer

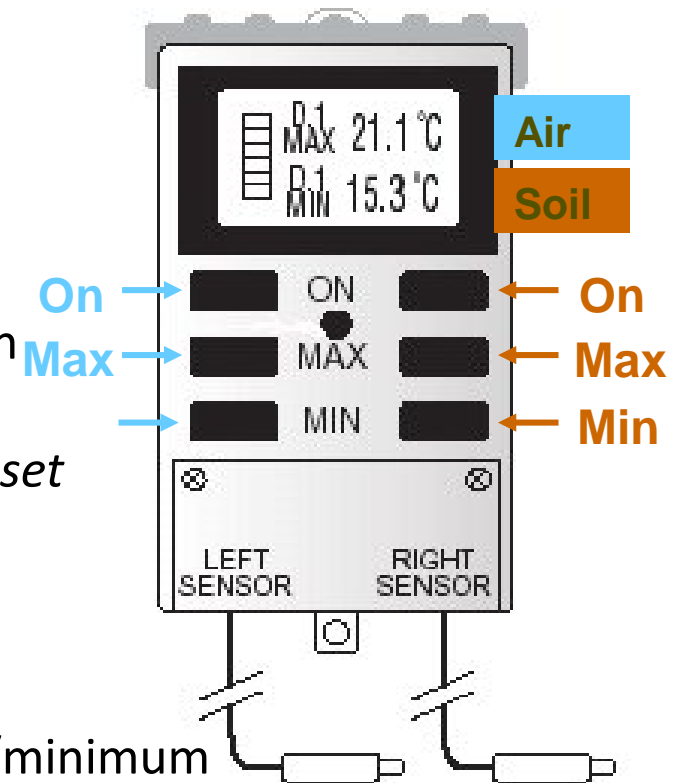
## Benefits

- Instruments already out
- Already equilibrated to outside
- More data



# Digital Multi Day Max/Min Thermometer

- Two sensors:
  - One measures air temperature
  - One measures soil temperature at a depth of 10cm
- Stores six days of max/min temperatures
- Must be reset to around the time of local solar noon **one time** when it is first set up
- The exact time it is reset is known as the *Time of Reset*

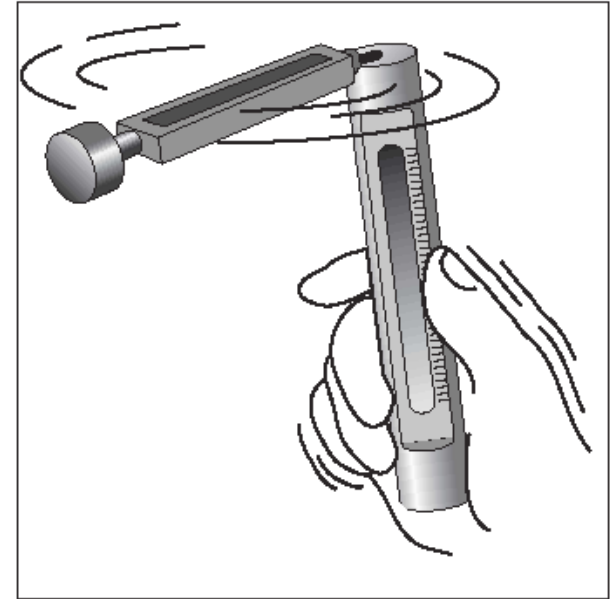


## For both air and soil temperatures:

- Press ON button to read current temperature
- Press the Max/Min button twice to read maximum/minimum temperature of first day (D.1)
- Continue to press Max/Min Button once to read temperatures of other days (D.2-D.6)

# Temperature without Instrument Shelter

- Instruments
  - Calibration Thermometer
  - Sling-psychrometer
- Considerations
  - Takes 3-5 min to equilibrate
  - Minimize 'influences' when reading T
    - Record every 3 min
    - Avoid Direct Sun (need shade)
    - Consider Ground cover
  - Transporting instrumentation
  - Calibration

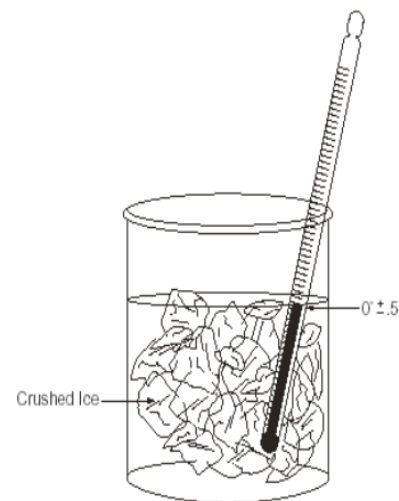


Suggested activity: Building a Thermometer

<https://www.globe.gov/documents/348614/e28a888c-830f-484a-8997-a660a3d48fe1>

# Calibrating Temperature

1. Submerge calibration thermometer in an ice-water bath for 10-15 minutes, stir occasionally  
Calibration thermometer should read between  $-0.5^{\circ}\text{C}$  and  $+0.5^{\circ}\text{C}$
2. Hang calibration thermometer in instrument shelter  
Read five sets of readings  
Record and report data to the GLOBE website



Thermometer Readings						
Reading Number	Date (Year/ Month/Day)	Local Time (Hour:Min)	UT Time (Hour:Min)	Calibration thermometer readings ( $^{\circ}\text{C}$ )	Digital air sensor readings ( $^{\circ}\text{C}$ )	Digital soil sensor readings ( $^{\circ}\text{C}$ )
1						
2						
3						
4						
5						

Thermometer Calibration Lab

<https://www.globe.gov/documents/348614/ff1147e1-6ae3-4eb1-b38c-20021910c0a8>

# Temperature Test

## Taking accurate temperature readings

- Do not breathe on, touch, stand too close or expose the thermometer to direct sunlight when using it.

- Read thermometer at eye level

- Read temperature from base of indicators

- Record current temperature

- Record maximum and minimum temperatures

- Record date and time (UTC)

- If no measurement for previous day, record only current temperature

- Reset maximum and minimum temperature markers

# Calibrate IRT

You should test that the infrared thermometer is measuring accurately. This can be done by testing the temperature of ice water. Ice water should be 32° F (0° C).

An infrared thermometer is measuring correctly if the instrument reads the temperature of the ice water bath within the range of 28-36° F (+/- 2° C). If the temperature observed is more than 36° F (+2° C), or less than 28° F (-2° C), try changing the battery. If the calibration still is off, the infrared thermometer needs to be replaced.





# Surface Temperature

- Once outside, look for a good area to observe surface temperature. Any surface can be used.
- Hold your arm at arm's length and point the instrument at the ground. Press the Recording Button to record the temperature.
- Be sure to have the instrument Sensing Eye parallel to the surface you want to measure. Be careful to not inadvertently record the temperature of your shoe or the surface in your own shadow.



Image: Kevn Czajkowski

Some questions to investigate:

- How does surface temperature compare with current air temperature?
- How does surface temperature vary with surface soil color?
- How does surface temperature change for different cover types (grass vs. asphalt for instance) on a cloudy day?
- How does the surface temperature change for different cover types when it is wet versus when it is dry?

# Clouds : updated Protocol planned March


Observer Name: \_\_\_\_\_ Study Site: \_\_\_\_\_

Date (ex. 2016 01 13): Year: \_\_\_\_ Month: \_\_ Day: \_\_

Time (ex. 24 Hour Clock: 14 26): Local: Hour \_\_ Minute \_\_ Universal: Hour \_\_ Minute \_\_

## 1. What is in Your Sky?

Total Cloud/Contrail Cover:

- ☐ Sky is Obscured 
☐ Heavy Rain ☐ Spray ☐ Haze  
☐ None (Go to box 2) ☐ Scattered (25-50%) ☐ Heavy Snow ☐ Smoke ☐ Volcanic Ash  
☐ Few (<10%) ☐ Broken (50-90%) ☐ Blowing Snow ☐ Dust  
☐ Isolated (10-25%) ☐ Overcast (90-100%)
- Go to box 6

\*If you can observe sky color or visibility, complete box 2

## 2. Sky Color and Visibility

- Sky Color: ☐ Cannot Observe ☒ Deep Blue ☐ Blue ☐ Light Blue ☐ Pale Blue ☐ Milky
- Sky Visibility: ☐ Cannot Observe ☒ Unusually Clear ☐ Clear ☐ Somewhat Hazy ☐ Very Hazy ☐ Extremely Hazy

### 3. High Level Clouds

- ☐ No High Level Clouds Observed  
(Go to box 4)

Cloud Type:

- ☐ Contrails (number of):
- ☐ Cirrus
- ☐ Cirrocumulus
- ☐ Cirrostratus

Cloud Cover:

- Few (<10%)
- Isolated (10%-25%)
- Scattered (25%-50%)
- Broken (50%-90%)
- Overcast (>90%)
- Opaque
- Translucent
- Transparent

#### 4. Mid Level Clouds

- ☒ No Mid Level Clouds Observed (Go to box 5)

Cloud Type:

- Altostratus
- Alto cumulus

Cloud Cover:

- Few (<10%)
- Isolated (10%-25%)
- Scattered (25%-50%)
- Broken (50%-90%)
- Overcast (>90%)
- Opaque
- Translucent
- Transparent

## 5. Low Level Clouds

- ☐ No Low Level Clouds Observed (Go to box 6)

Cloud Type:

- ☐ Fog
- ☐ Nimbostratus
- ☐ Cumulonimbus
- ☐ Stratus
- ☐ Cumulus
- ☐ Stratocumulus
- ☐ Scattered (25%-50%)
- ☐ Broken (50%-90%)
- ☐ Overcast (>90%)
- ☐ Transparent

## 6. Surface Conditions

**Mandatory:**

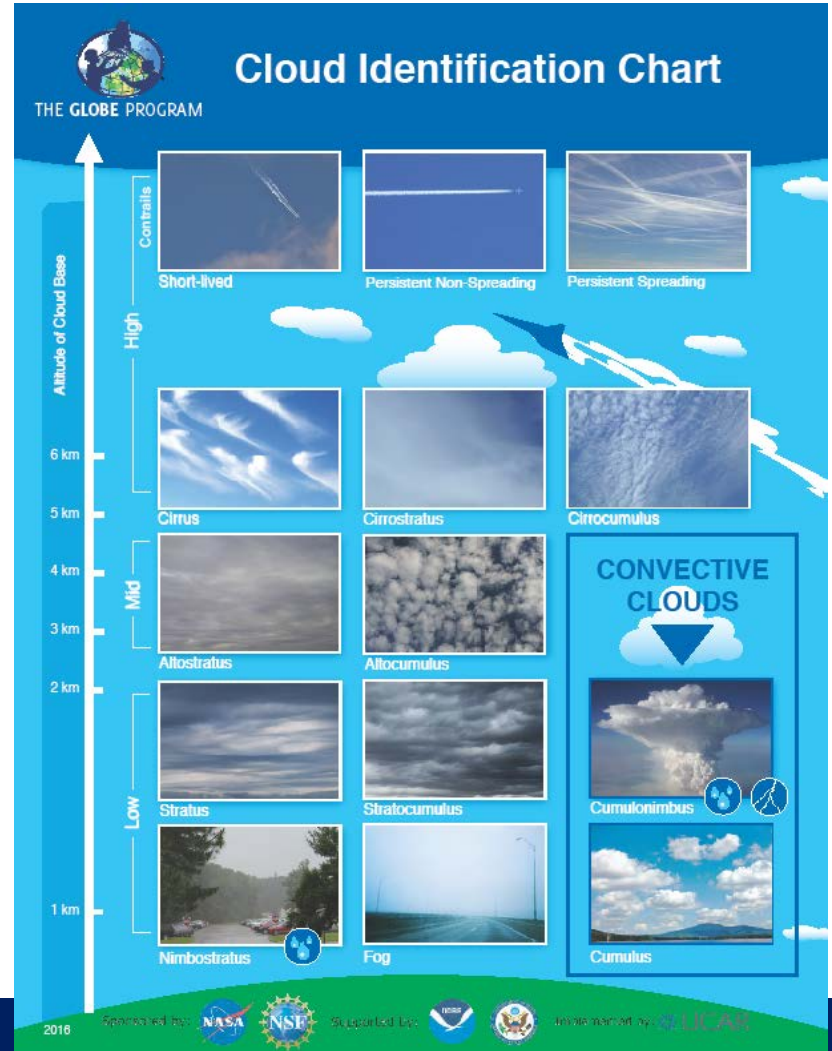
Optional:

You may submit any or all

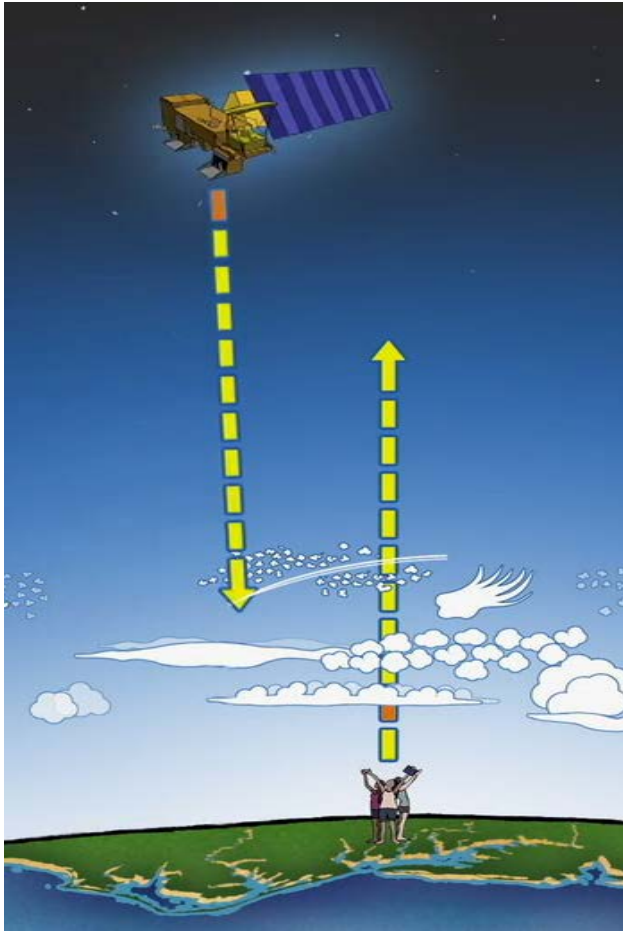
Snow/Ice	<input type="radio"/>	<input type="radio"/>	Dry Ground	<input type="radio"/>	<input type="radio"/>
Standing Water	<input type="radio"/>	<input type="radio"/>	Leaves on Trees	<input type="radio"/>	<input type="radio"/>
Muddy	<input type="radio"/>	<input type="radio"/>	Raining/Snowing	<input type="radio"/>	<input type="radio"/>

Temperature: \_\_\_\_ °C  
Barometric Pressure: \_\_\_\_  
Relative Humidity: \_\_\_\_ %

Comments:



# Clouds : NASA Satellite Matching



Ground Observation:					GEO Satellite					Aqua Satellite				
Date: 2016-11-29		Universal Time: 18:01			Date: 2016-11-29		Universal Time: 17:50			Date: 2016-11-29		Universal Time: 17:55		
Opacity	Cloud Cover	Type	Visualization		Altitude (km)	Opacity	Cloud Cover	Phase Temp(C)		Altitude (km)	Opacity	Cloud Cover	Phase Temp(K)	
Total Ground Cloud Cover: No Clouds (0%)					Total GEO Cloud Cover: 100.00 %					Total Aqua Cloud Cover: 98.06 %				
H I G H						6.9	Opaque 53.67	Broken (50%-90%) 73.12	mixed -19.84 (C)		7.14	Opaque 20.82	Broken (50%-90%) 61.46	mixed 248.24 (K)
M I D						4.94	Opaque 23.79	Scattered (25%-50%) 26.88	mixed -8.60 (C)		3.72	Opaque 27.16	Scattered (25%-50%) 36.6	mixed 264.39 (K)
L O W	Opaque	Overcast (~90%)												
Sky Visibility : no report										<p>Corresponding Aqua MODIS Satellite Images</p> <p><a href="#">Rapid Response</a></p> <p><a href="#">NASA Worldview</a></p>				
Sky Color : no report														
<p><b>Surface Conditions</b></p> <p>Snow/Ice No</p> <p>Standing Water No</p> <p>Muddy No</p> <p>Dry Ground No</p> <p>Leaves on Trees No</p> <p>Raining or Snowing No</p>														
<p>Please comment on the quality of the match: Might there be anything about the ground observations or the satellite data that would explain any disagreement between the two?</p>														

# Clouds : Opacity



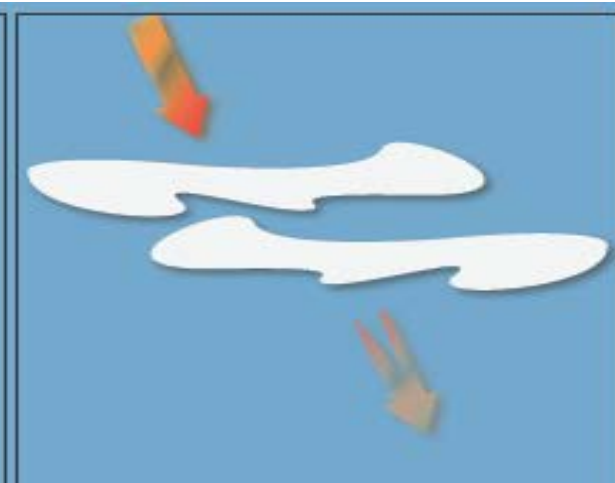
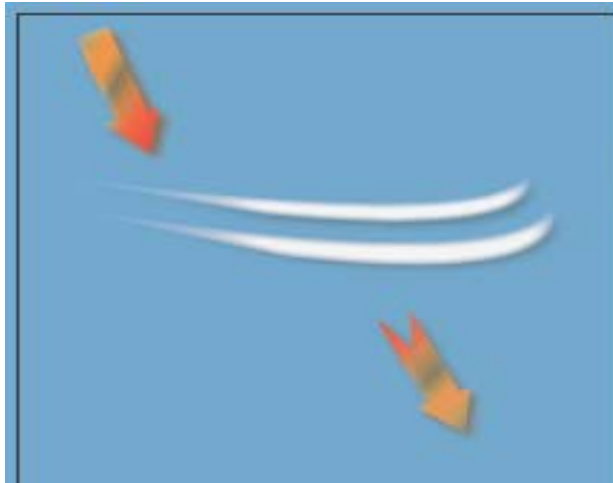
Transparent



Translucent



Opaque



# Clouds : Sky Conditions

## Visibility

Unusually Clear

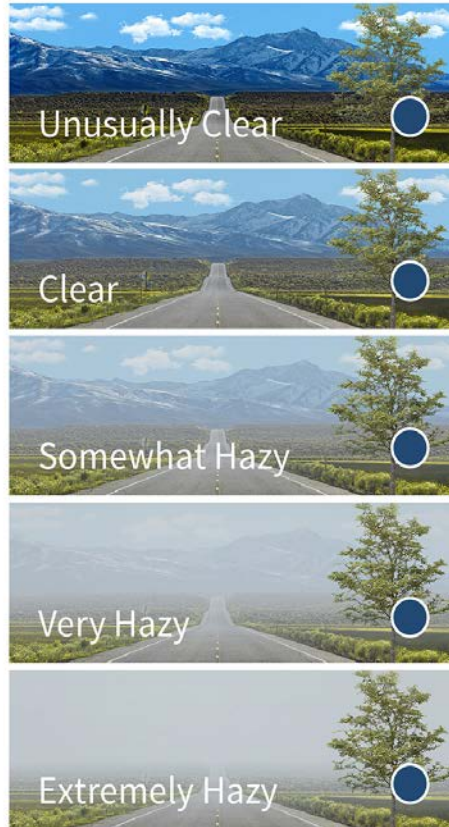
Clear

Somewhat Clear

Somewhat Hazy

Extremely Hazy

What is the sky visibility?



What is the sky color?

Deep Blue	<input type="radio"/>
Blue	<input type="radio"/>
Light Blue	<input type="radio"/>
Pale Blue	<input type="radio"/>
Milky	<input checked="" type="radio"/>

## Sky Color

Deep Blue

Blue

Light Blue

Pale Blue

Milky



# Elementary GLOBE: Sky Observers

Elementary GLOBE What's Up in the Atmosphere?

## Sky Observers Daytime Sky Report

Face away from the Sun  
and look for the deepest  
color of blue.

Name \_\_\_\_\_ Date \_\_\_\_\_

Time \_\_\_\_: \_\_\_\_ AM or PM (circle one)

Location \_\_\_\_\_

### Are there clouds?

- ☐ no clouds  
☐ some clouds  
☐ lots of clouds  
☐ fog

### Is there precipitation?

- ☐ none  
☐ rain  
☐ sleet  
☐ snow

### Is there wind?

- ☐ gentle wind  
☐ strong wind  
☐ no wind

Note: If there are lots of clouds, then this is not a good day  
to make a sky color report. Try again tomorrow!

### A drawing of my sky:

### The deepest color I see:

- ☐ deep blue  
☐ blue  
☐ light blue  
☐ pale blue  
☐ milky  
☐ other \_\_\_\_\_

### Visibility:

- ☐ very clear  
☐ clear  
☐ somewhat hazy  
☐ very hazy  
☐ extremely hazy

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Simon, Anita, Dennis

Daytime Sky Report Date: May 28, 2015 Time: 10:00 AM Location: Near School

Are there clouds?  
☒ no clouds  
☐ some clouds  
☐ lots of clouds  
☐ fog

Is there precipitation?  
☒ none  
☐ rain  
☐ sleet  
☐ snow

Is there wind?  
☐ gentle wind  
☐ strong wind  
☒ no wind

The deepest color I see:  
☐ deep blue  
☐ blue  
☒ light blue  
☐ pale blue  
☐ milky  
☐ other

Visibility:  
☐ very clear  
☐ clear  
☒ somewhat hazy  
☐ very hazy  
☐ extremely hazy

"Now we need to record the visibility. What's that?" Simon asked.

"Visibility is how clear the atmosphere is, so we can look at those trees and describe if they look clear or fuzzy. If the trees are fuzzy then the sky is hazy," Anita explained.

Dennis added, "I think the trees are a little fuzzy and the sky is somewhat hazy today."

Simon commented, "That's a good description, let's mark that on our sheets."



<https://www.globe.gov/web/elementary-globe/overview/aerosols/learning-activities>



# Let's Make Observations

## Site Definition

### Add site type

#### Atmosphere

☒ Atmosphere

☐ Surface Temperature

#### Hydrology

☐ Hydrology

#### Land Cover/Biology

☐ Land Cover

#### Earth as a System

☐ Greening

☐ Phenological Gardens

#### Soil

☐ Soil Characterization

☐ Soil Moisture and Temperature

### Photos +

Site Name

Coordinate

Latitude \*

☐ North ☐ South

Source of Coordinates

☐ GPS ☐ Other

Map Satellite

Google

## Digital Multi-Day Minimum/Maximum Thermometer Data Sheet

School Name: \_\_\_\_\_

Observer names: \_\_\_\_\_

Date: Year \_\_\_\_\_ Month \_\_\_\_\_ Day \_\_\_\_\_

Your Time of Reset in Universal Time (UTC): \_\_\_\_\_

**Note:** If Min/Max Air and Soil Temperatures are read at a Time of Reset is 12:00 and you are reading the thermometer at the same time as the date you read your thermometer, then the date you read the thermometer is the date you read the thermometer.

If Min/Max Air and Soil Temperatures are read at a Time of Reset is 12:00 and you are reading the thermometer at the same time as the date you read the thermometer, then the date you read the thermometer is the date you read the thermometer.

### Multi-Day Min/Max Air Temperature

Label on Thermometer Display	Corresponding Date
D1	
D2	
D3	
D4	
D5	
D6	

### Multi-Day Min/Max Soil Temperature

Label on Thermometer Display	Corresponding Date
D1	
D2	
D3	
D4	
D5	
D6	

GLOBE® 2014

## Atmosphere Investigation Surface Temperature Data Sheet

School Name: \_\_\_\_\_

Observer names: \_\_\_\_\_

Date: Year \_\_\_\_\_ Month \_\_\_\_\_ Day \_\_\_\_\_

### \*Surface Temperature

Site's Overall Surface Condition (Select One)

Sample	Temperature Measurement (°C)
1	
2	
3	
4	
5	
6	
7	
8	
9	

Comments: \_\_\_\_\_

### Atmosphere Investigation: Cloud Protocol Data Sheet

1

Observer Name: \_\_\_\_\_

Study Site: \_\_\_\_\_

Date (ex. 2016 01 13): Year: \_\_\_\_\_ Month: \_\_\_\_\_ Day: \_\_\_\_\_

Time (ex. 24 Hour Clock: 14 26): Local: Hour \_\_\_\_\_ Minute \_\_\_\_\_ Universal: Hour \_\_\_\_\_ Minute \_\_\_\_\_

### 1. What is in Your Sky?

Total Cloud/Contrail Cover:

☐ Sky is Obscured

- ☐ None (Go to box 2) ☐ Scattered (25-50%)  
☐ Few (<10%) ☐ Broken (50-90%)  
☐ Isolated (10-25%) ☐ Overcast (90-100%)

\*If you can observe sky color or visibility, complete box 2

- ☐ Fog ☐ Sand  
☐ Heavy Rain ☐ Spray ☐ Haze  
☐ Heavy Snow ☐ Smoke ☐ Volcanic Ash  
☐ Blowing Snow ☐ Dust

Go to box 6

### 2. Sky Color and Visibility

Sky Color: ☐ Cannot Observe ☐ Deep Blue ☐ Blue ☐ Light Blue ☐ Pale Blue ☐ Milky

Sky Visibility: ☐ Cannot Observe ☐ Unusually Clear ☐ Clear ☐ Somewhat Hazy ☐ Very Hazy ☐ Extremely Hazy

### 3. High Level Clouds

☐ No High Level Clouds Observed (Go to box 4)

Cloud Type:

- ☐ Contrails (number of): \_\_\_\_\_  
☐ Cirrus  
☐ Cirrocumulus  
☐ Cirrostratus



Cloud Cover:

- ☐ Few (<10%)  
☐ Isolated (10%-25%)  
☐ Scattered (25%-50%)  
☐ Broken (50%-90%)  
☐ Overcast (>90%)

Visual Opacity:

- ☐ Opaque  
☐ Translucent  
☐ Transparent

### 4. Mid Level Clouds

☐ No Mid Level Clouds Observed (Go to box 5)

Cloud Type:

- ☐ Altostratus ☐ Altimcumulus

Cloud Cover:

- ☐ Few (<10%)  
☐ Isolated (10%-25%)  
☐ Scattered (25%-50%)  
☐ Broken (50%-90%)  
☐ Overcast (>90%)

Visual Opacity:

- ☐ Opaque  
☐ Translucent  
☐ Transparent

### 5. Low Level Clouds

☐ No Low Level Clouds Observed (Go to box 6)

Cloud Type:

- ☐ Fog ☐ Stratus  
☐ Nimbostratus ☐ Cumulus  
☐ Cumulonimbus ☐ Stratocumulus

Cloud Cover:

- ☐ Few (<10%)  
☐ Isolated (10%-25%)  
☐ Scattered (25%-50%)  
☐ Broken (50%-90%)  
☐ Overcast (>90%)

Visual Opacity:

- ☐ Opaque  
☐ Translucent  
☐ Transparent

### 6. Surface Conditions

Mandatory:

- Snow/Ice ☐ Yes ☐ No Dry Ground ☐ Yes ☐ No  
Standing Water ☐ Yes ☐ No Leaves on Trees ☐ Yes ☐ No  
Muddy ☐ Yes ☐ No Raining/Snowing ☐ Yes ☐ No

Optional:

You may submit any or all

Temperature: \_\_\_\_\_°C

Barometric Pressure: \_\_\_\_\_mb

Relative Humidity: \_\_\_\_\_%

Comments: \_\_\_\_\_

# Data Entry Options



[Data Entry - Desktop Forms](#) – These pages are for entering environmental data – collected at defined sites, according to protocol, and using approved instrumentation – for entry into the official GLOBE science database.



[Data Entry - Mobile App](#) – The app allows users to enter data directly from an iOS or Android device for any GLOBE protocol.



[Training Data Entry](#) – These pages are for practicing data entry, either during workshops or when providing others a view of the data entry process. These data entry pages are based on the newer designed data entry pages. These data are not intended for entry into the official GLOBE science database.



[GLOBE Observer](#) – Version 1.1 of the app includes GLOBE Clouds, which allows you to photograph clouds and record sky observations and compare them with NASA satellite images. Future versions of GLOBE Observer will add additional tools for you to use as a citizen environmental scientist.



[Email Data Entry](#) – Data can also be entered via email.

Helpful tutorials about website and data entry:  
<https://www.globe.gov/get-trained/using-the-globe-website>

# Data Entry

## Site Definition



### Add site type

#### Atmosphere

- ☐ Atmosphere
- ☐ Surface Temperature

#### Hydrosphere

- ☐ Hydrology

#### Biosphere

- ☐ Land Cover
- ☐ Greening
- ☐ Phenological Gardens
- ☐ Lilacs

#### Pedosphere

- ☐ Soil Characterization
- ☐ Soil Moisture and Temperature

### Photos →

### Site Name \*

\* indicates a field is required

Elizabeth City State University Dixon Hall

Site ID 36142

### Coordinates

#### Latitude \*

36.278935 °

☒ North ☐ South

#### Longitude \*

-76.214786 °

☐ East ☒ West

#### Elevation \*

3.7 m

[Set elevation](#)

### Source of Coordinates Data \*

☐ GPS ☒ Other



Go to: [training.globe.gov](https://training.globe.gov)



# Data Retrieval and Visualizations



THE GLOBE PROGRAM  
Visualization System

Measurements

Data Counts

Load Filters

Save Filters

Choose Base Map

Select L

Powered b

Sites

2016-09-15

North Pacific

United States

Mexico

North Atlantic

Spain

Italy

Turkey

Iraq

Afghanistan

Kazakhstan

Mongolia

China

South Korea

Japan

My  Sites Measurements

Layers

Data Layers

Add +



Surface Temperature

Contours



LAYERS FILTERS

[Contour Layer Opacity](#)

☐ Map Coordinates Grid

Filters

Multi-Site Plots

School: Wyomissing Area Jr./Sr. High School

Site: Wyomissing Surface Temperature Site - Asphalt Parking Area

Measurements

Data Counts

School Info

Site Info

Photos



Atmosphere

Surface Temperature

☒ Average Surface Temperature

Data Date Range: 2015-09-14 to 2017-02-16

Measurement:

Measured At: 2016-09-15 16:11:00  
Solar Measured At: 2016-09-15 11:13:00  
Solar Noon At: 2016-09-15 16:58:00  
Average Surface Temperature: 44.8 °C  
Number Of Samples Taken: 9  
Elevation: 86.00 m



30 Days

1 Year

Custom

<https://www.globe.gov/globe-data/visualize-and-retrieve-data>

# Are My Data Reasonable?

- Clouds
- Air Temperature
  - Current
  - Maximum
  - Minimum
- Surface Temperature



It should be stressed that your students may collect accurate data that is unexpected. Estimating what to expect will also help students recognize when their data are unusual and should prompt more investigation.

## **What To Do and How To Do It**

### *Stage 1 — Estimating data about classroom objects*

1. Divide your class into teams of four students. Provide each team with measuring instruments and have the teams collect classroom data. Each team should collect and record 5 to 10 classroom data values.

#### **Beginning students might:**

- count the number of books, tiles, fingers, etc. in the classroom
- measure the length of ten books, the room, around a desk, etc.
- measure the amount of water in a glass, the sink, etc.

#### **Intermediate students might:**

- measure and add distances (the height of a desk and all the desks in the room)
- calculate the height of all text books piled together.

#### **Advanced students might:**

- calculate areas in square meters, volumes in cubic centimeters, and weights..

2. Now have each team “disguise” part of their data by exaggerating the numbers. For instance, a cube with a volume of 10 cubic centimeters should be changed to 20 or even 200 cubic centimeters. The less the exaggeration, the greater the



5. At the end of the activity, discuss the process of estimating, and the concept of reasonableness. You might want to repeat this activity to see if the students improve.

### *Stage 2 — Estimating soil water content data*

Your students will apply the same concept to soil moisture (you can play the data game with any type of data). You can use soil moisture data that your students have already collected as part of the protocol, or with soil moisture data from the samples students brought from home as part of the learning activity [\*Soils as Sponges: How Much Water Does Soil Hold?\*](#)

As described in Stage 1 above, have your students change some of the data values for soil water content, and then have other students guess which values are accurate and which are exaggerated. Score as described above.

### *Stage 3 — Using data from the GLOBE Student Data Server*

1. Have the students access the GLOBE Student Data Server to browse through soil water content data that have been gathered by other GLOBE sites. They should find:
  - the range of data for each depth
  - the range of data for schools nearby
  - the range of data for schools in arid regions or forests or grasslands
  - the most common values.
2. Discuss the ranges and common values, and have your students reflect on how this information would help them to do better in the data game.

Suggested Activity: The Data Game

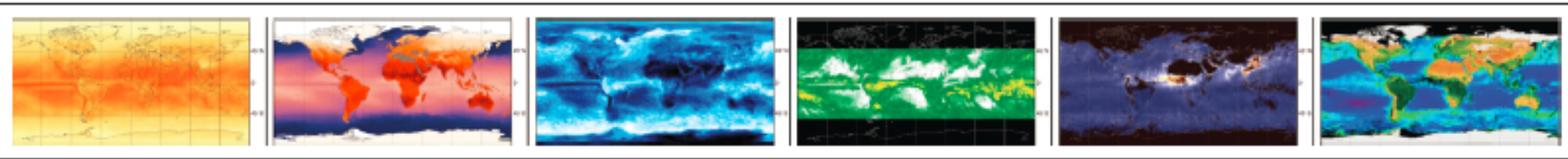
<https://www.globe.gov/documents/352961/5a184b04-9ac0-4284-be86-f5938bd43a6f>



# Investigating Earth Systems Images

## Explore the Images:

- What variable did you examine and what is the range of values shown on the scale bars?
- Where in the world do you find the highest and lowest values (the extremes) of the data in your images?
- Why do these locations experience the extremes and not other locations?
- What changes do you see through the year?
- Are any patterns in the data noticeable?



# GLOBE Implementation Across Grade Bands

- What considerations do we need to make for implementing GLOBE at different grade bands?
- Where does GLOBE best fit into the curriculum?

# Science & Engineering Practice Skills



1. Asking Questions
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations
7. Engaging in argument from evidence
8. Obtaining, evaluating and communicating information

# Aerosols Storybook – Picture Walk



# Elementary GLOBE Storybooks & Inquiry

1. Questions	2. Evidence	3. Explanations	4. Connect	5. Communicate
Learner engages in scientifically oriented questions	Learner gives priority to evidence in responding to questions	Learner formulates explanations from evidence	Learner connects explanations to scientific knowledge	Learner communicates and justifies their explanations

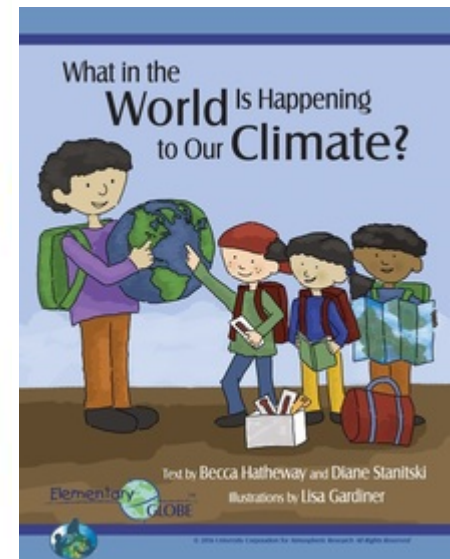
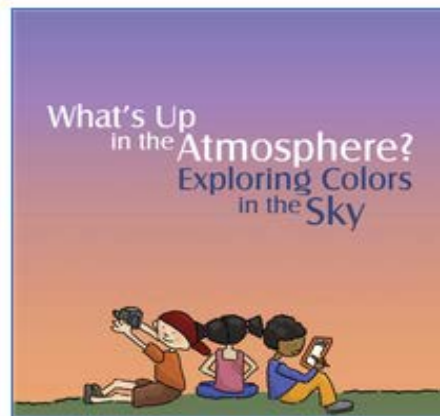
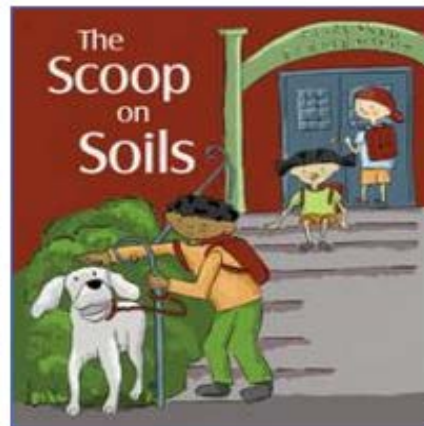
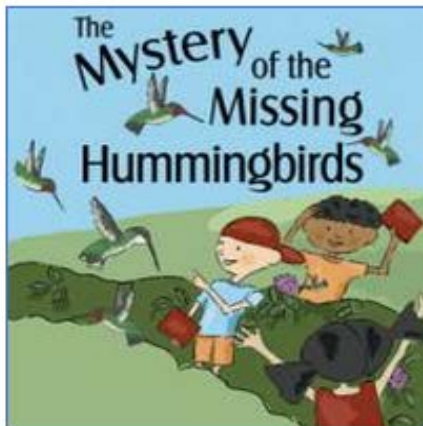
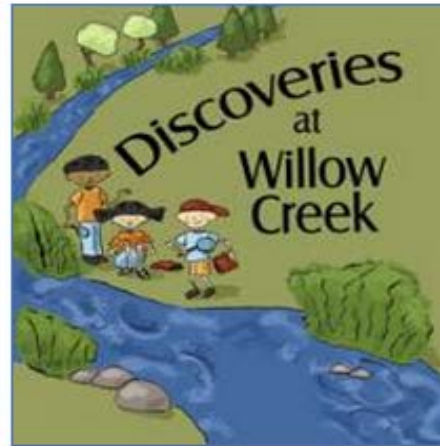
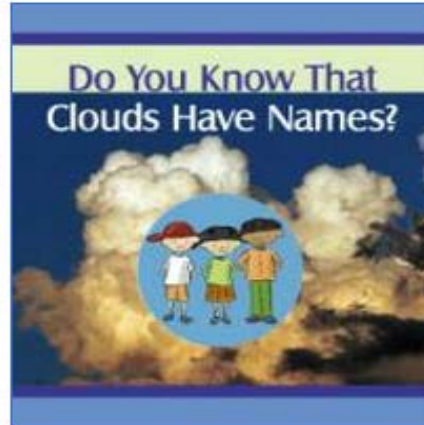
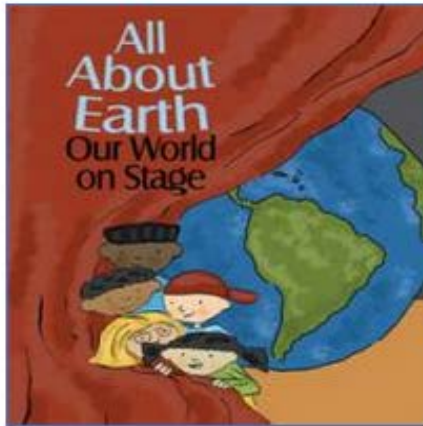
Figure 3. Essential Features of Classroom Inquiry (Taken from the National Research Council's *Inquiry and the National Science Education Standards*).

1. Questions	2. Evidence	3. Explanations	4. Connect	5. Communicate
The GLOBE Kids ask, "Where did the hummingbirds go?" after observing the birds' disappearance in their garden.	Simon makes a chart to record their observations of the soil from the three different holes that Scoop had dug.	The GLOBE Kids look at their wall charts of observations and explain that the hummingbirds could stay there only when they had enough food and shelter.	Scientist Hannah helps the GLOBE Kids connect their observations to the snowmelt feeding the creek.	The GLOBE Kids each justify why their part of the Earth system is most important, and then how each is connected in the Earth system, during the classroom play.

Figure 4. Examples of the Five Essential Features of Inquiry from the *Elementary GLOBE* storybook narratives.



# Exploring Earth Science through GLOBE Elementary Story Books



# Elementary GLOBE Progression Example

## Book -> Activities -> GLOBE Data Collection



Anita **REALLY** likes Hummingbirds. She watches them. She draws pictures of them. But one day in the fall, the birds are mysteriously gone. Simon, Anita, Dennis, and their classmates discover why the hummingbirds left and where they went.

HUMMINGBIRDS	SUMMER	AUTUMN
Needs blooming flowers insects to eat tree leaves to live in	lots of hummingbirds	hummingbirds go away
They can't get these things here during our winter so they go to Central America	leaves are green	leaves turn colors
	lots of flowers	plants lose flowers
	hot outside	cool outside

In the classroom the students posted information about the seasons and the hummingbirds. Ms. Patel added information Ernesto's class sent about Costa Rica. Then they stepped back to look at all the information.



Name \_\_\_\_\_

Date \_\_\_\_\_

Weather \_\_\_\_\_

Temperature ☐ Hot ☐ Warm ☐ Cool ☐ Cold

**Big Picture View**  
Write or draw your observations here.

Color swatches: black, red, blue, yellow, green, orange, purple, white, brown, pink, gray.

11-2-10	leaves	
Fall	1 Red	1 Blue
Season	leaves or grass	leaves
2 Yellow	2 Green	1 Orange

### Green-Up / Green-Down



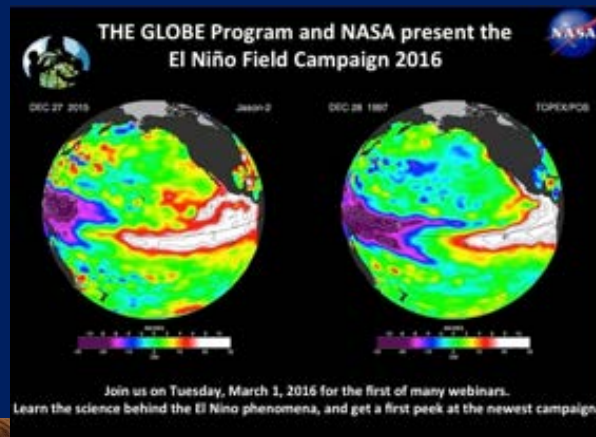


# GLOBE Engagement Events

**20<sup>th</sup> THE GLOBE PROGRAM**  
20<sup>th</sup> Anniversary • 1995 – 2015



**THE GLOBE DATA ENTRY CHALLENGE**  
With Your Help, It All Adds Up



**20<sup>th</sup> THE GLOBE PROGRAM**  
20<sup>th</sup> Anniversary • 1995 – 2015

**STUDENT ART COMPETITION  
2015 CALENDAR**



[www.globe.gov](http://www.globe.gov)

## GLOBE 2016 INTERNATIONAL VIRTUAL SCIENCE FAIR

SHOW THE WORLD WHAT YOU'VE LEARNED!  
ENTRIES DUE 11 MARCH 2016

[GLOBE.GOV/SCIENCE-FAIR](http://GLOBE.GOV/SCIENCE-FAIR)



## Mt. Kilimanjaro Student Expedition



**GLOBE LEARNING EXPEDITION  
& 18<sup>TH</sup> ANNUAL PARTNER MEETING**



**INDIA**  
GLOBE for Sustainable Communities 3-8 August 2014



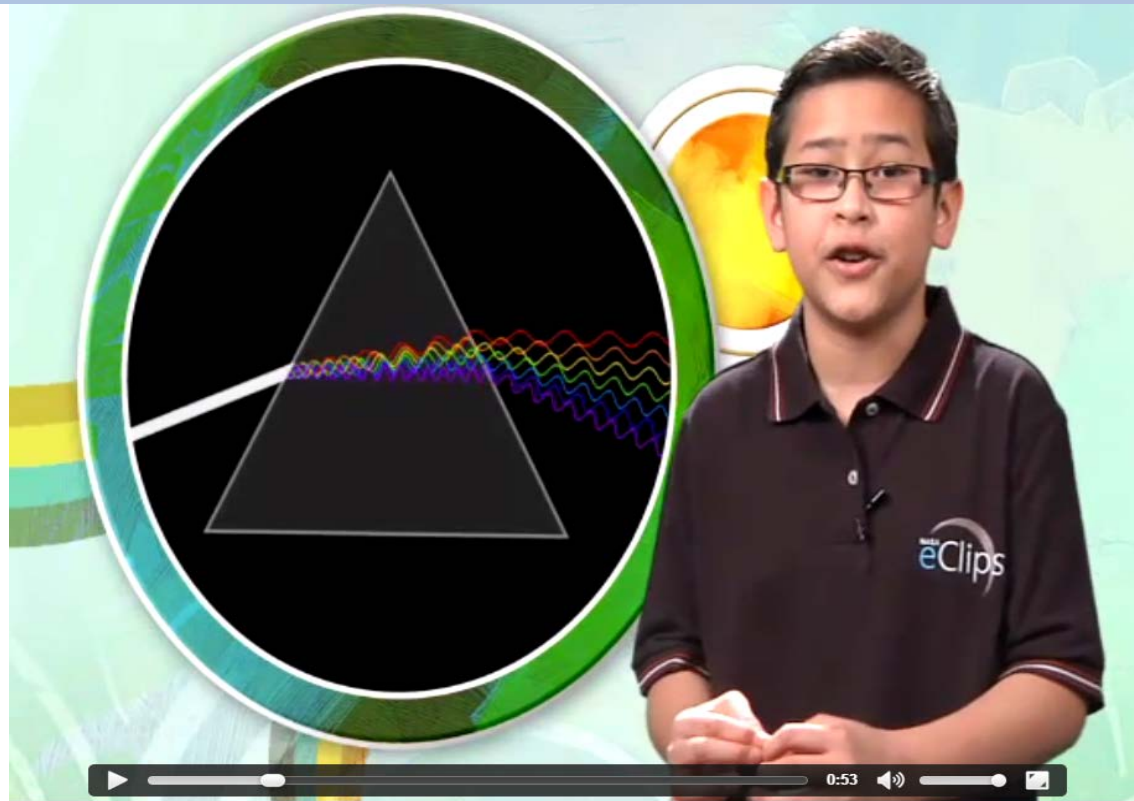
# Contact NASA Langley GLOBE Partnership

- Questions about Implementation? Please feel free to contact us.
- Jessica Taylor, Lead GLOBE Trainer  
[jessica.e.taylor@nasa.gov](mailto:jessica.e.taylor@nasa.gov)  
(757) 864-6358
- Partnership Webpage:  
<http://www.globe.gov/web/nasa-langley-research-center/overview>

# NASA Resources in Elementary

- NASA Education Website  
<http://www.nasa.gov/audience/foreducators/k-4/index.html>
- NASA Science Education Lessons:  
<http://nasawavelength.org/>
- The Space Place: <http://spaceplace.nasa.gov/>
- Climate Kids: <http://climatekids.nasa.gov/>
- NASA e-Clips, Our World:  
<http://nasaclips.arc.nasa.gov/playlists/ourworld>

# Our World: Sunsets and Atmospheres (SAGE eClips for Elementary)



*Watch online at: <http://science-edu.larc.nasa.gov/skycolor/video/>*