Protocol Training Slides for:
Automated Weather Stations (AWS)

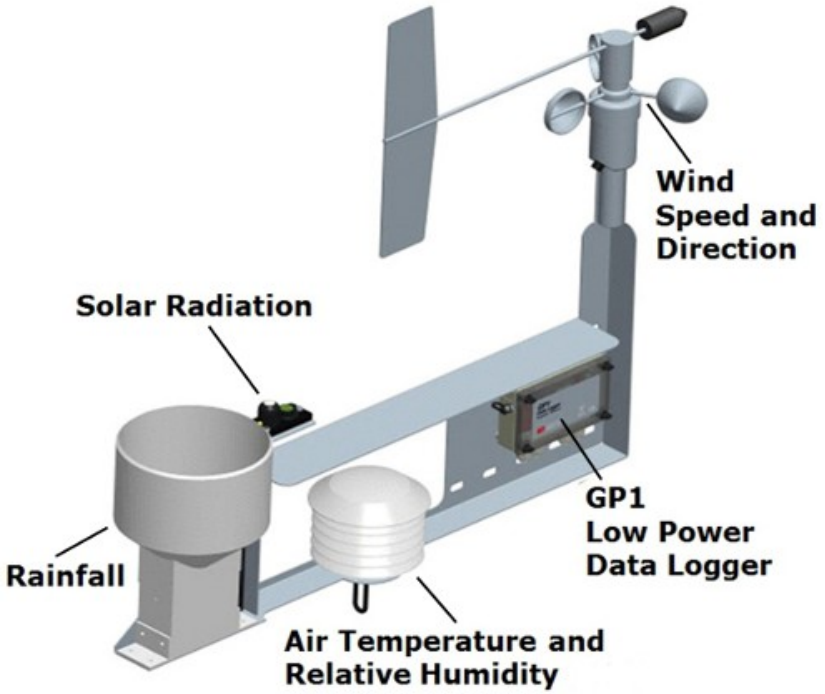
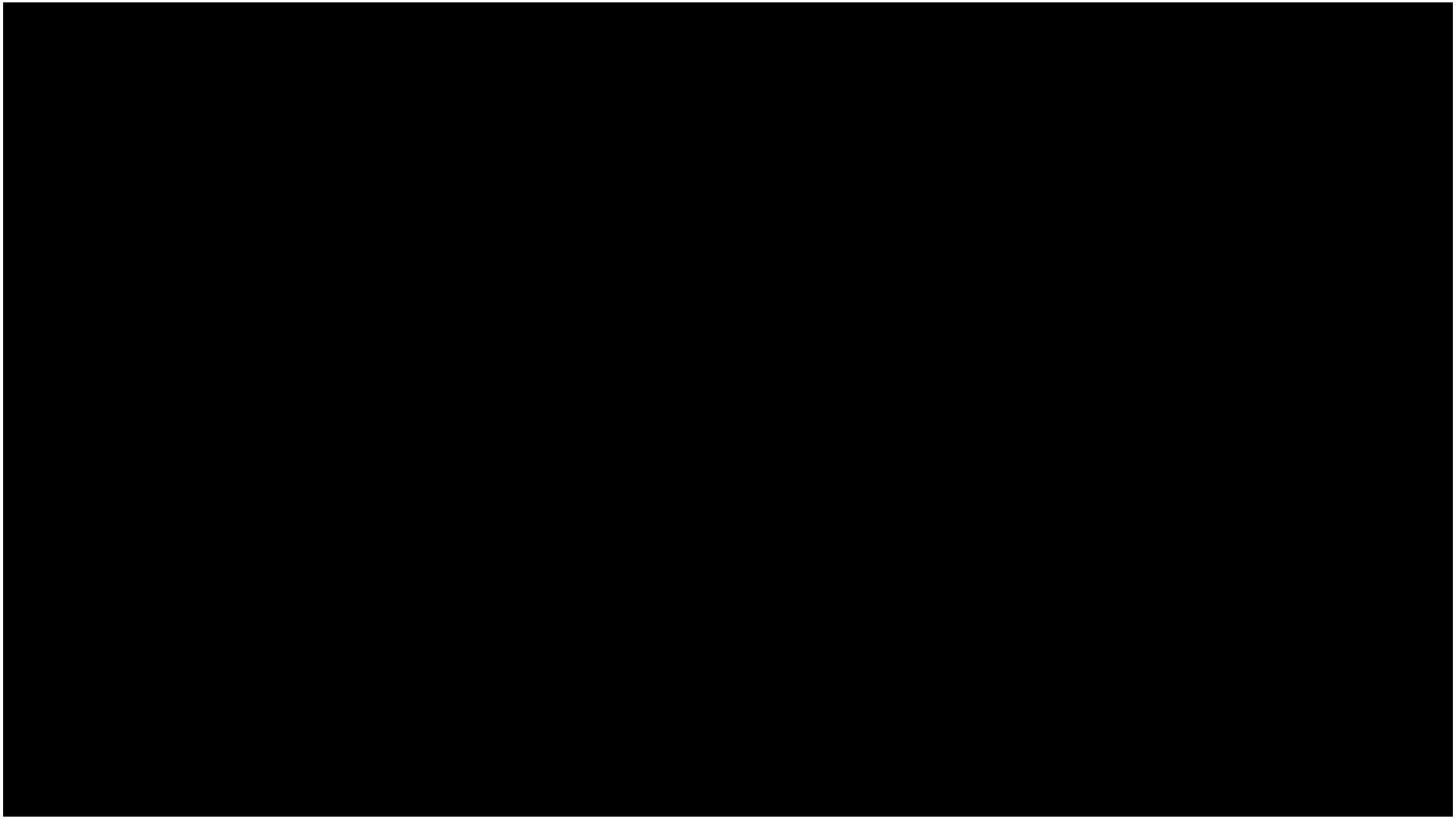


Photo credit: Daniel Miller

Automated Weather Stations (AWSs) can collect a variety of data for upload to GLOBE. They are also known as Personal Weather Stations (PWSs).

Video: Alaska National Park Service Automated Weather Stations



https://www.youtube.com/watch?v=TFvoFvGHpPc&list=PLN_nieRfTTW57Wj-6AWXCFHfmEAzUglLd

The Weather

- Describes the state of the atmosphere at a given point in time and geographic location
- Caused by the interactions of solar radiation, Earth's large ocean, diverse landscapes and motion in space
- Is crucial in gaining an understanding of the Earth system

Atmosphere Protocol

Automated Weather Stations

Overview

This module

- Describes the different types of automated weather stations
- Provides an introduction to collecting and entering your data on the GLOBE website

Learning Objectives

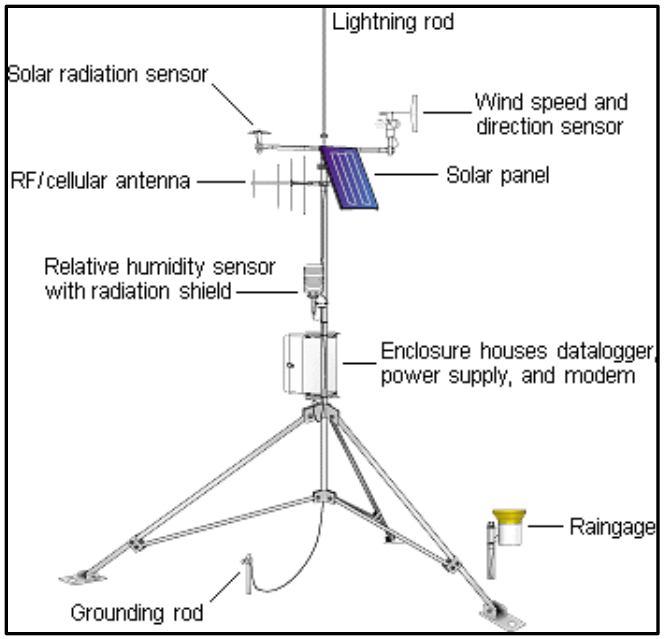
After completing this module, you will be able to do

- Describe the different automated weather stations (AWS)
- List the instruments contained in AWS and the data each collects
- Determine the correct location of AWS
- Upload data to GLOBE website
- Visualize data using GLOBE Visualization Site and formulate your own questions about weather

What is an Automated Weather Station (AWS)?

An AWS can collect meteorological data from multiple instruments.

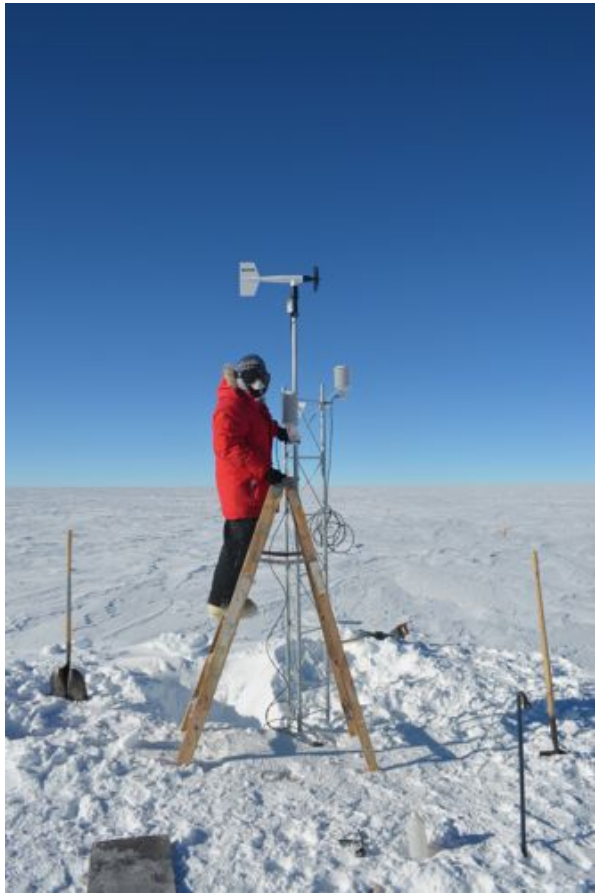
Parameter	Instrument
Temperature	Thermometer
Precipitation	Rain Gauge
Humidity	Hygrometer
Atmospheric Pressure	Barometer
Wind Speed	Anemometer
Wind Direction	Wind Vane
Solar Radiation	Pyranometer
Soil Moisture	Soil Hygrometer
Soil Temperature	Soil Thermometer



How does an AWS work?

Data collected by the AWS is contained in a **data logger** and can be emailed directly to GLOBE. AWSs are often powered by **solar panels** and accessible via **mobile phone**.

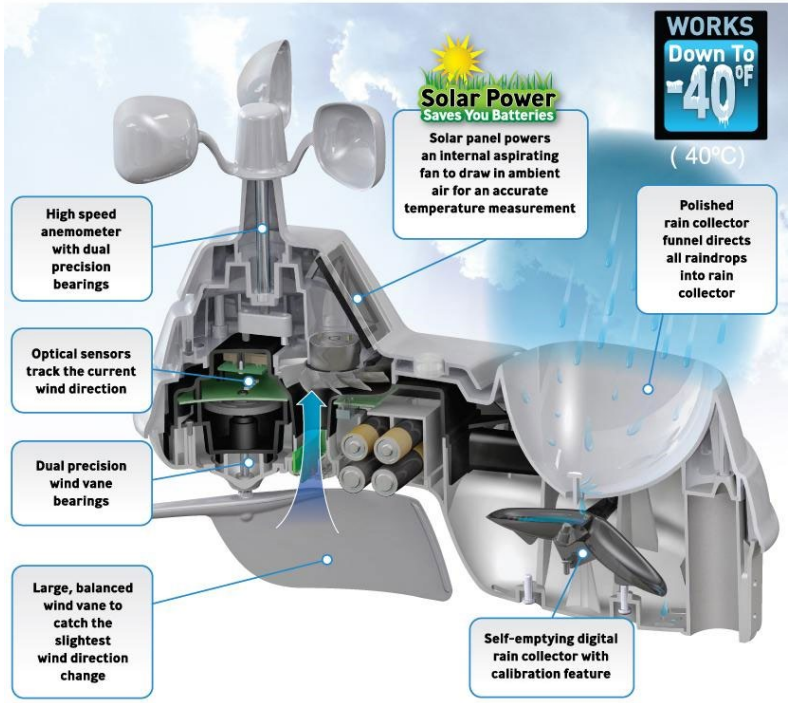
Where are AWSs used?



Scientists use AWSs around the world, in all types of environments!

What's inside of the AWS?

Inside the AWS are some delicate instruments that are protected from the elements by a protective casing. Batteries are also stored inside. Many AWS have solar panels for power in addition to batteries.



Your data can also assist with NASA's GPM Program!

- Earth based measurements of precipitation assist the Global Precipitation Measurement Mission by providing *in situ* data.
- GPM aids in understanding water-borne diseases, weather forecasting, and freshwater availability.
- Knowing how much precipitation falls and where it falls helps to understand weather and climate impacts.
- GLOBE students have taken precipitation observations for a GPM field campaign.

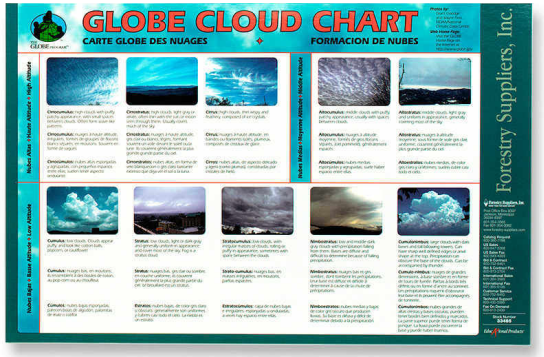
NASA'S GLOBAL PRECIPITATION MEASUREMENT MISSION (GPM)

YOUR measurements can help NASA scientists answer questions

- How do urban areas affect the temperature around them?
- How does daily weather change seasonal and yearly averages?
- How do local factors such as elevation and water bodies affect the weather?
- How does El Nino affect your weather?

What I Need to Collect Data

Instruments	Your eyes, GPS unit, Automated Weather Station
References	*GLOBE cloud chart*
When	AWS take weather observations continuously (typically every 15 minutes)
Where	A good observation site (See *Documenting your atmosphere study site)*
Form	*Atmosphere Investigation Data Sheet*



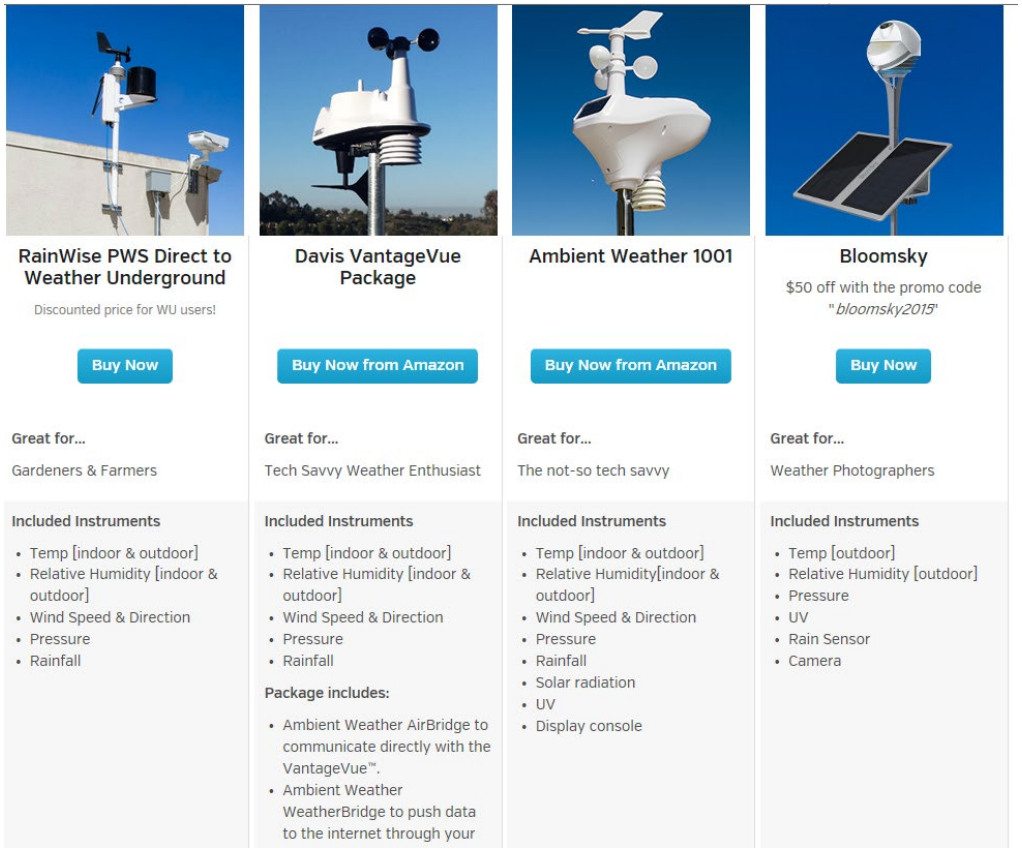
What Type of AWS Should I Get?

- There are many different types of AWSs:
- $ Very simple ones with only two or three instruments
- $$$ Very expensive ones with lots of instruments
- Which one you get depends on your interests and budget
- An AWS can be permanently installed or set up temporarily

Photo Credit: Daniel Miller

Where can I get an AWS?

- You can purchase an AWS from many different vendors, including Amazon.
- You can use this link to comparison shop: at the Weather Underground.com



RainWise PWS Direct to Weather Underground

Discounted price for WU users!

Buy Now

Great for...

Gardeners & Farmers

Included Instruments

- Temp [indoor & outdoor]
- Relative Humidity [indoor & outdoor]
- Wind Speed & Direction
- Pressure
- Rainfall

Davis VantageVue Package

Buy Now from Amazon

Great for...

Tech Savvy Weather Enthusiast

Included Instruments

- Temp [indoor & outdoor]
- Relative Humidity [indoor & outdoor]
- Wind Speed & Direction
- Pressure
- Rainfall

Package includes:

- Ambient Weather AirBridge to communicate directly with the VantageVue™.
- Ambient Weather WeatherBridge to push data to the internet through your

Ambient Weather 1001

Buy Now from Amazon

Great for...

The not-so tech savvy

Included Instruments

- Temp [indoor & outdoor]
- Relative Humidity[indoor & outdoor]
- Wind Speed & Direction
- Pressure
- Rainfall
- Solar radiation
- UV
- Display console

Bloomsky

$50 off with the promo code "*bloomsky2015*"

Buy Now

Great for...

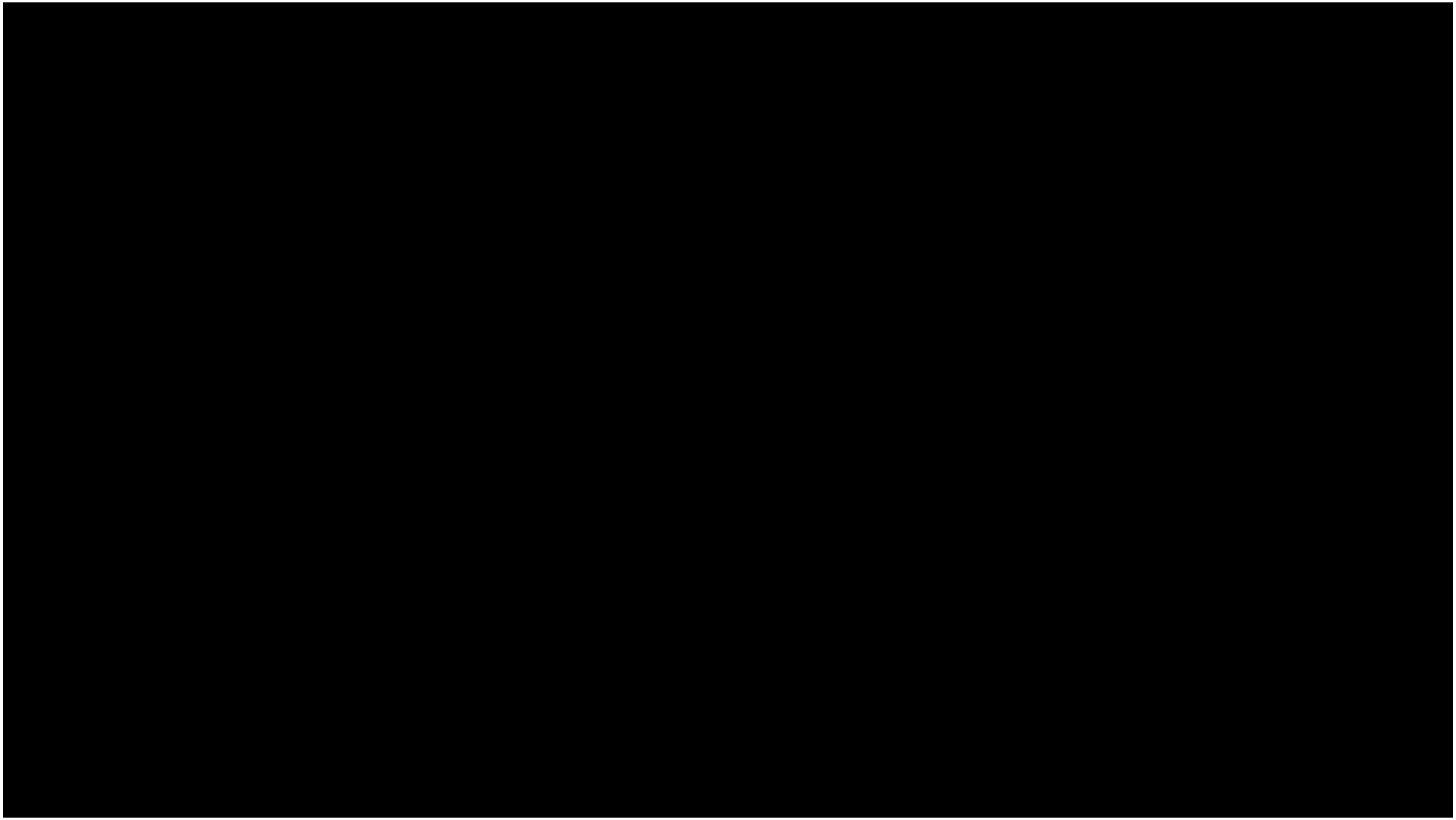
Weather Photographers

Included Instruments

- Temp [outdoor]
- Relative Humidity [outdoor]
- Pressure
- UV
- Rain Sensor
- Camera

You can start with a simple version and then add sensors and instruments as you like!

Video: Comparing Automated Weather Stations



https://www.youtube.com/watch?v=-TkrAliNqSg

Assembling your AWS

Once you receive your AWS, it will take approximately one hour to assemble using the manufacturer's instructions.

Where should I install my AWS?

- You should install your AWS in a place that is easily accessible to you.
- However, it should not be installed between buildings or under trees.
- A location near your home or school in an open area that is grassy is best.

Go here for a good installation guide:
http://www.wunderground.com/weatherstation/installationguide.asp

What are some things that can interfere with the AWS?

- Obstructions to wind (ex. buildings)
- Things that give off humidity (ex. trees)
- Things that give off heat (ex. pavement and rooftops)

Therefore, place your AWS in an area that is away from trees, pavement and rooftops and that has open access to wind flow.

CAUTIONS!

Wasps or spiders may try to set up a home inside of the protective casing of your AWS!

CAUTIONS!

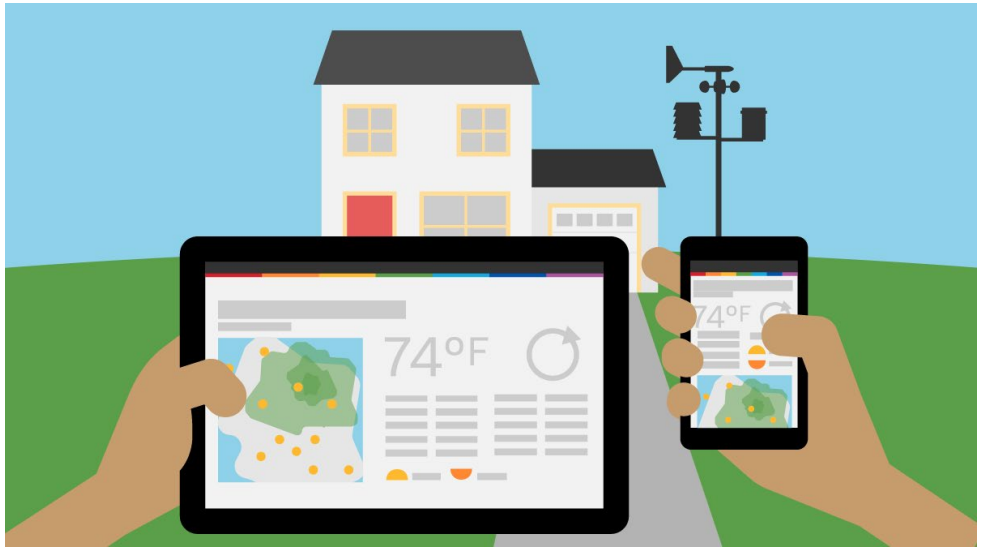
Check the operating temperatures of your AWS in the manufacturer's instructions. Some AWS will not operate in extremely cold environments!

Protecting Your AWS

You can protect your AWS from people and animals by placing fencing around it.

Data from your AWS

You can view data from your AWS directly on your smart phone or tablet; however, you should also share it with the GLOBE community.



For your AWS data to be available to teachers and students around the world, you will need to upload your data to the GLOBE website or use the email approach to send the data to the GLOBE database.

Entering Data

Click on the AWS name below to go to the GLOBE Protocols

Davis	Earth Networks
RainWise	WeatherHawk

Collecting Data

1) Choose and purchase an AWS according to your budget and predicted use.
2) Set up your AWS in an open area following the manufacturer's instructions. Install each of the sensors you purchased.
3) Collect GPS data for the **center** of the site (latitude, longitude and elevation).
4) Record your site data on an Atmosphere Investigation data sheet.
5) Use the Cloud Protocol to record cloud observations.
6) Set up your AWS to log readings in 15-minute intervals. Transfer the data to your computer using the directions included with the AWS data software.

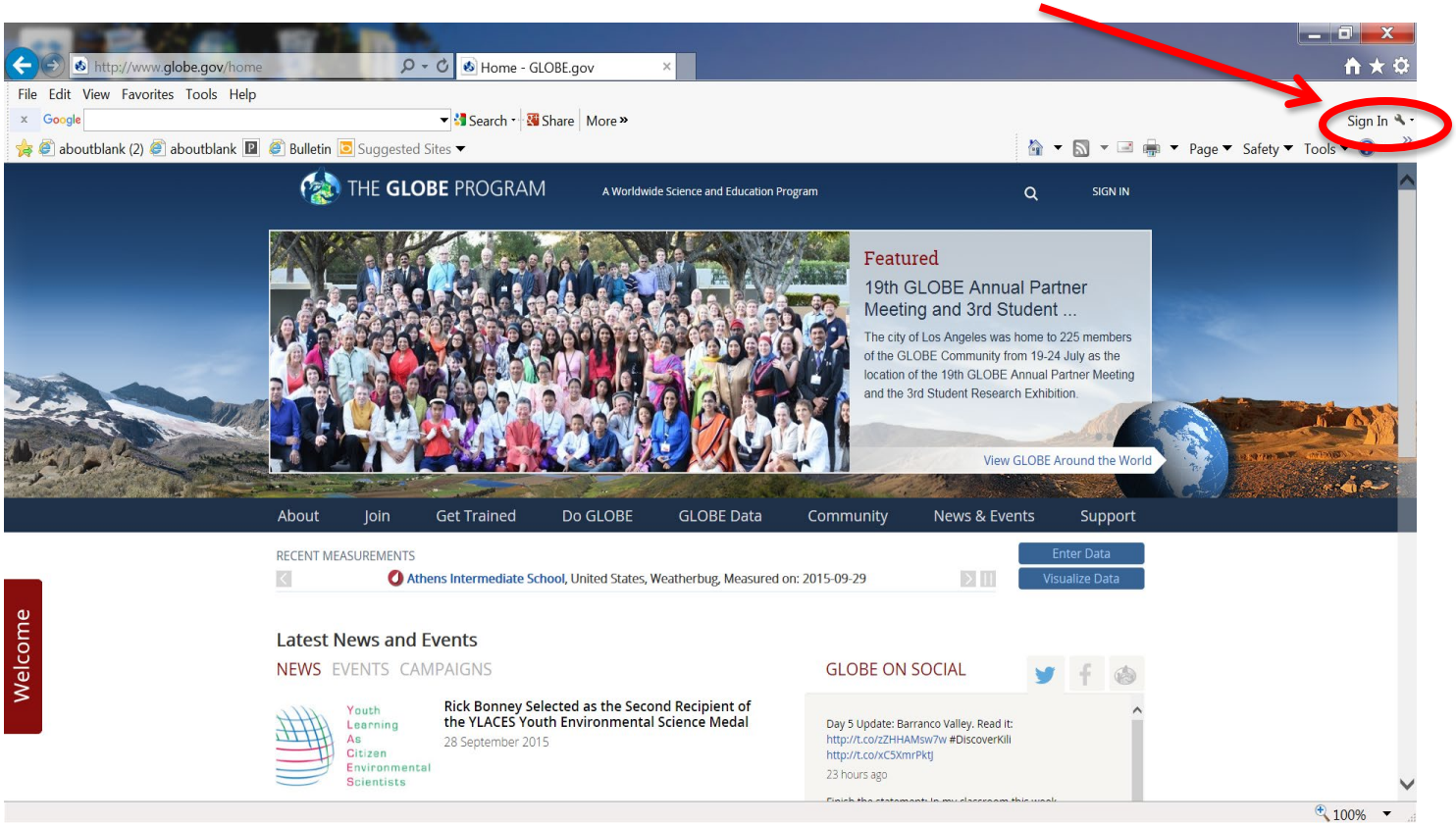
Entering Data

10) Log into the GLOBE website.
11) Set up an Atmosphere Site
12) Under Thermometer Type choose the type of AWS you have: Davis, AWS Earth Networks Station, Rainwise, and WeatherHawk.
13) For Earth Networks, set up and connect your AWS through https://earthnetworks.com/
14) Get a Earth Networks ID
15) Enter the Station ID that you got from Earth Networks.
16) Add other descriptions of your site including pictures.

Everything should be ready for GLOBE to pull your data from your AWS to the GLOBE website.

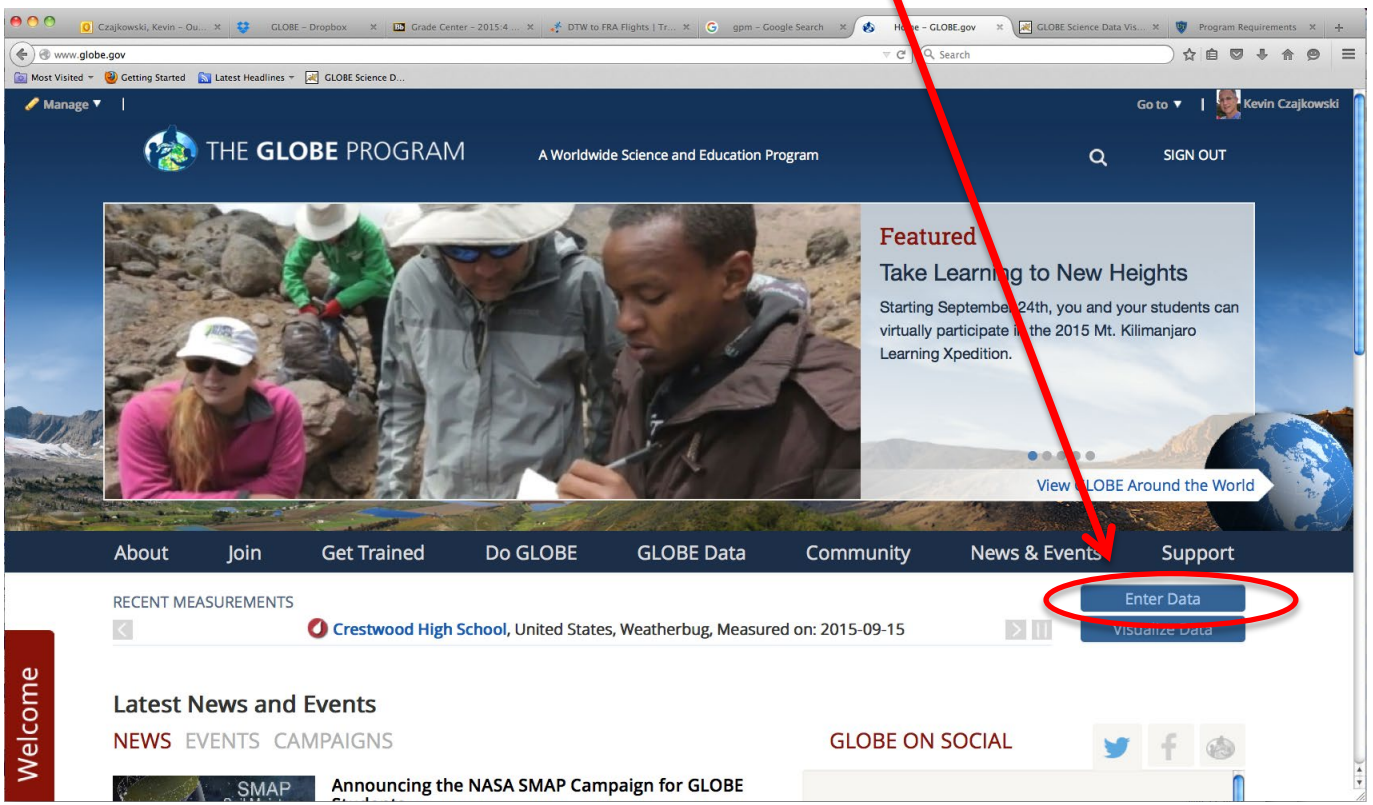
Entering Data

Go to www.globe.gov and click sign in.



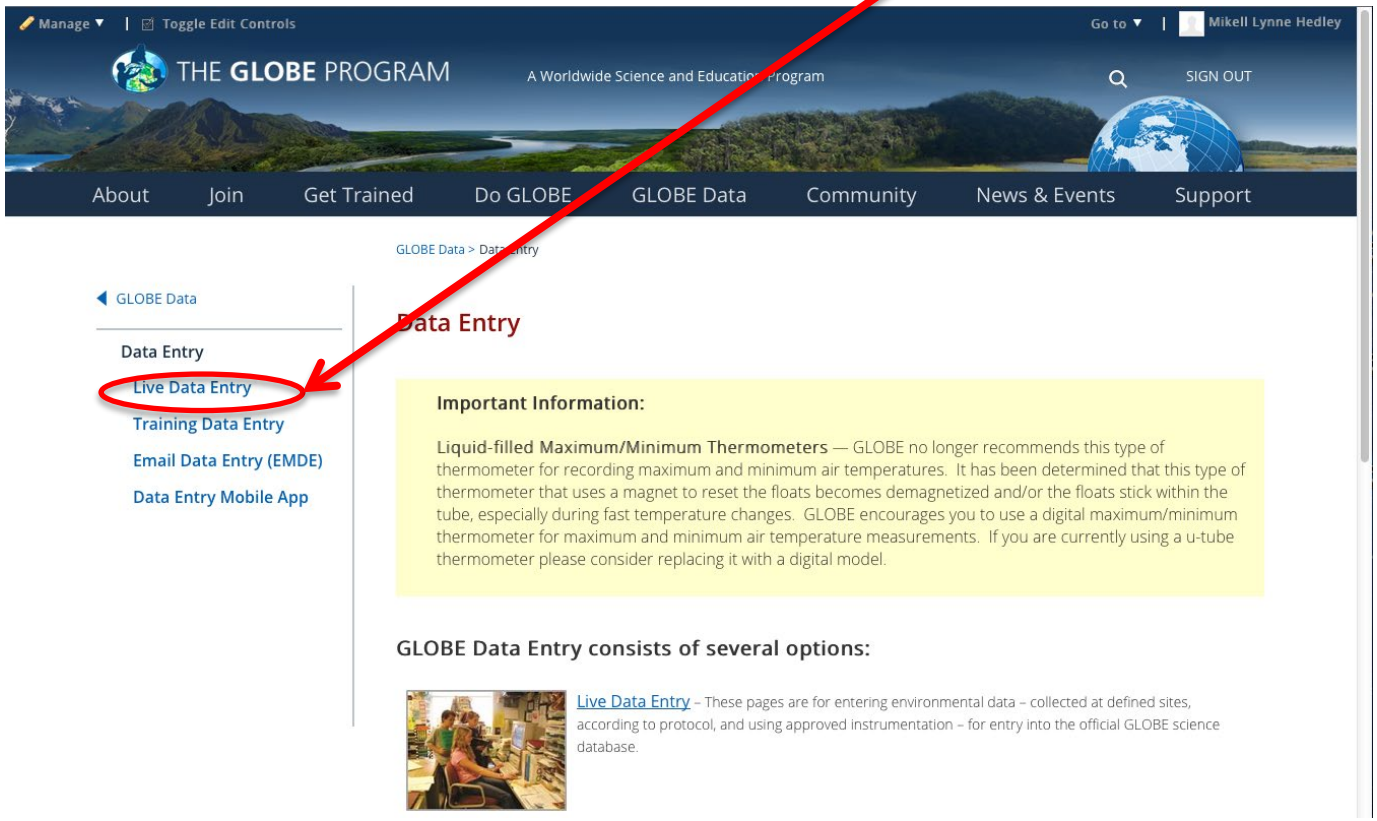
Entering Data

Now click on **Enter Data.**



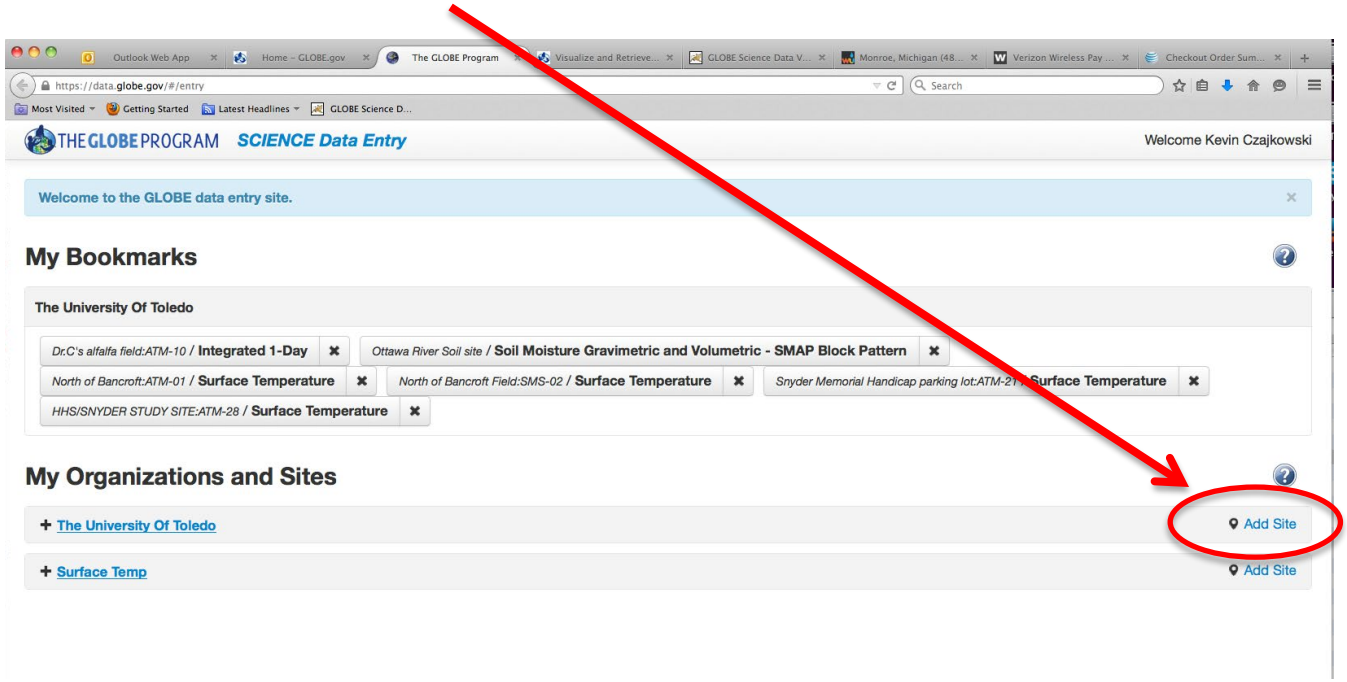
Entering Data

Choose **Live Data Entry.**



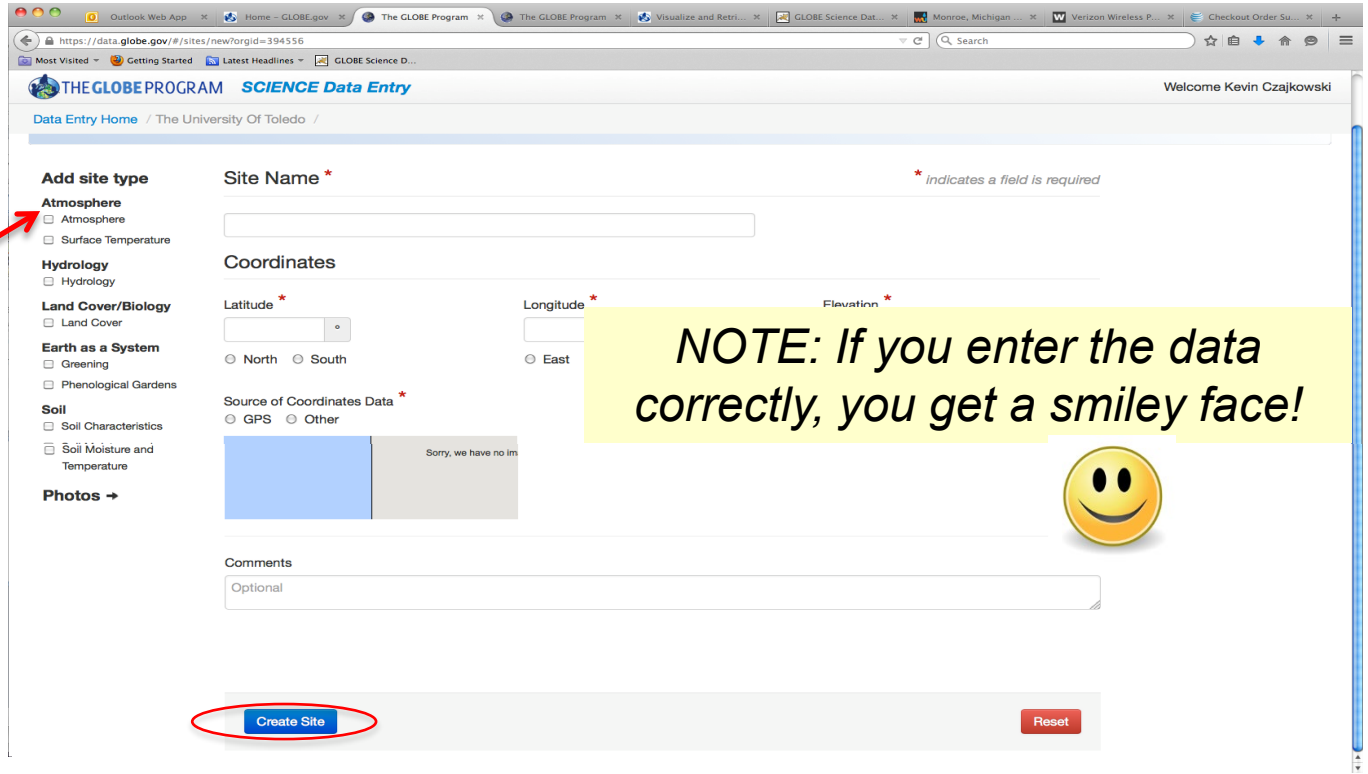
Entering Data

If you have not already done so, add a new site.



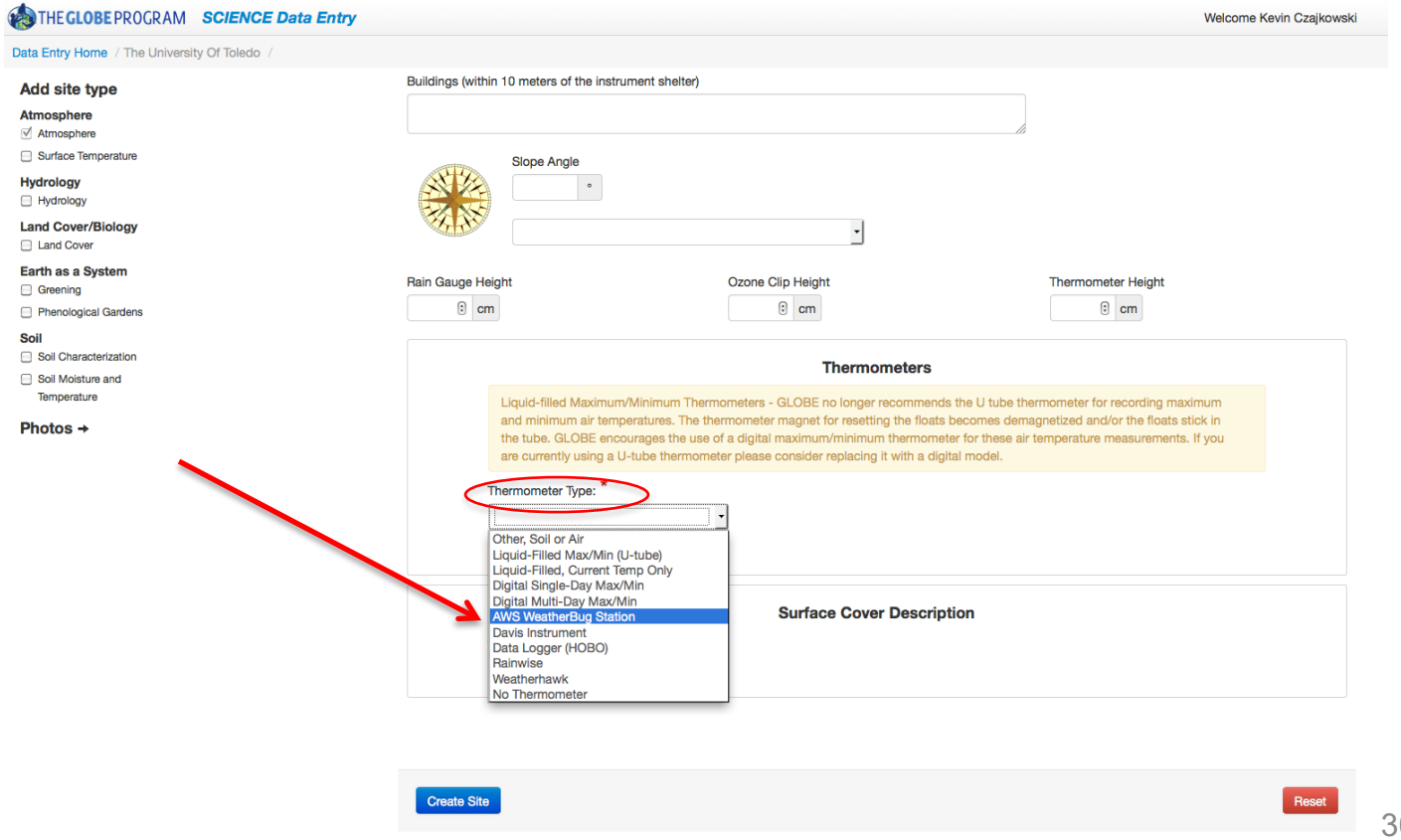
Entering Data

Enter an Atmosphere Site name, and latitude and longitude for the center of your site, and click on **Create Site**.



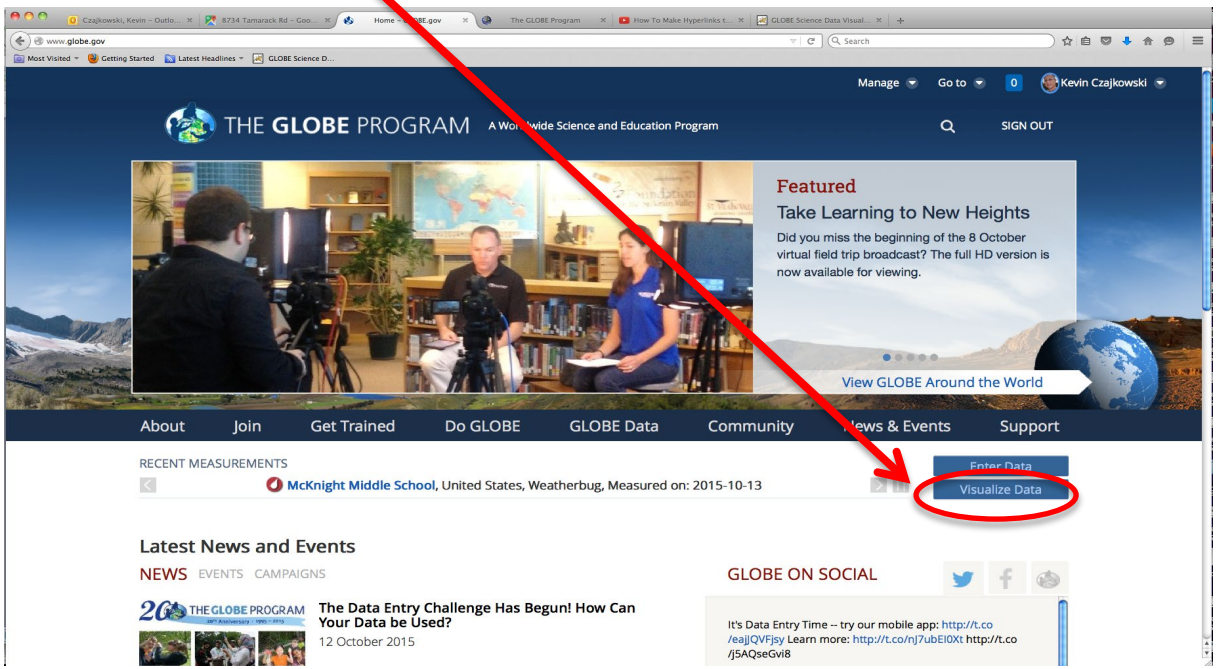
Entering Data

Choose the AWS that you have in the Thermometer Type



Retrieving Data from the GLOBE Visualization

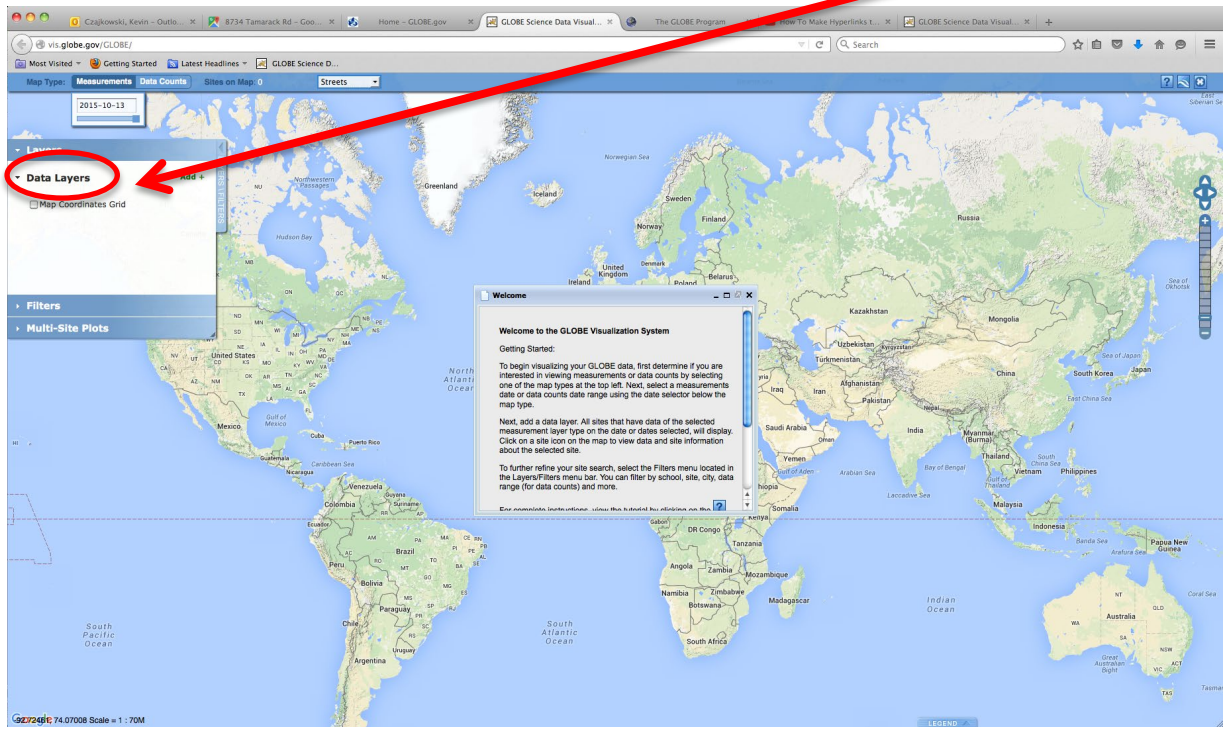
Click on **Visualize Data**



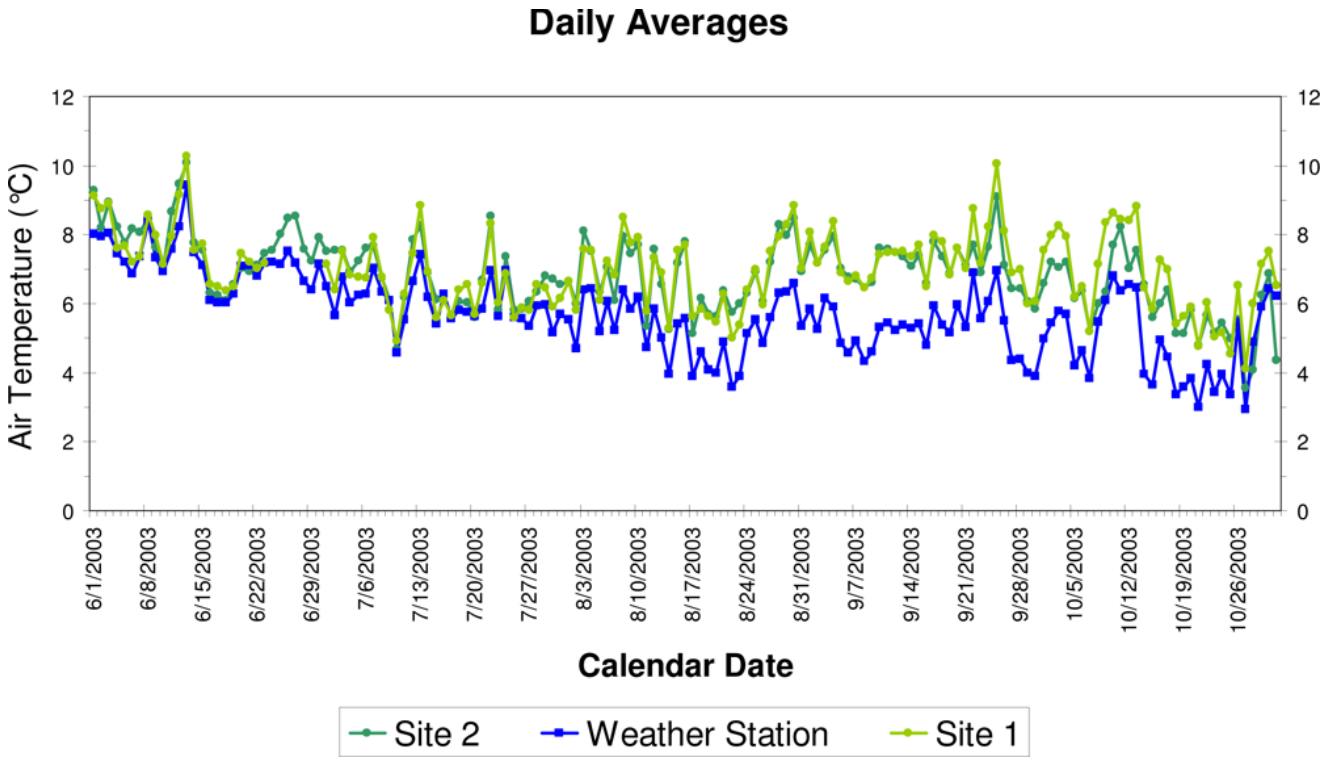
E-training is available to explore the full power of the visualization system.

Retrieving Data from the GLOBE Visualization

Close the **Welcome** box and click on ***Add +*** to add a layer



Once you've entered your data, you can view it.



GLOBE allows you to analyze your data.

What Have I Learned?

- What is an automated weather station (AWS)?
- What instruments does an AWS contain?
- What data is collected by each instrument in AWS?
- Why it is it important to collect weather data?
- Where can I purchase an AWS?
- Where should I place my AWS?
- What do I need to collect data?
- How do I submit data to GLOBE?
- What can I do with the data submitted to GLOBE?

FAQs

Is there additional help on the GLOBE website on how to set up an automated weather station?

Yes. Here are some additional links: Davis AWS

Installing the weather station

Here is a tutorial about how to connect the station to GLOBE

Weather Station Manual

Further Resources

- For GLOBE E-training go to: https://www.globe.gov/get-trained/protocol-e-training/modules
- For information on purchasing GLOBE supplies go to: http://www.globe.gov/web/north-america/resources/globe-equipment-suppliers
- What is a Personal Weather Station? http://www.wunderground.com/weatherstation/whatispws.asp
- Personal Weather Station Buying Guide: http://www.wunderground.com/weatherstation/buyingguide.asp
- Hydrometeorlogical Networks in the U.S.: http://www.eol.ucar.edu/projects/hydrometnet/
- Davis Weather Stations videos: https://www.youtube.com/user/davisinstruments/videos
- Earth Networks Weather Stations: https://www.earthnetworks.com/products/weather-station/
- Ambient Weather GLOBE Program Products: http://www.ambientweather.com/globeprogram.html
- Ambient Weather GLOBE Compatible Weather Station Software: http://www.ambientweather.com/glcowestso.html
- Scientific Sales, Inc. Weather Stations: http://www.scientificsales.com/
- WeatherHawk Weather Stations: http://www.weatherhawk.com/weather-stations
- How WeatherHawk Stations work: http://www.weatherhawk.com/education-more
- WeatherHawk Lesson Plans for K-12 Teachers: http://www.weatherhawk.com/lesson-plans
- Simple Homemade Weather Station for Kids: http://celebrating200years.noaa.gov/edufun/book/BuildyourownWeatherStation.pdf