



Trees Around the GLOBE Student Research Campaign

European Phenology Campaign Collaboration

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WHY IS TREE HEIGHT SO IMPORTANT AND WHY DOES NASA AND THE GLOBE PROGRAM CARE?

Tree height is the most widely used indicator of an ecosystem's ability to grow trees Tree height allows you to track the growth of trees over time

The **GLOBE** Program

The GLOBE Tree height observations can help researchers understand the gain or loss of biomass which can inform calculations of the carbon that trees and forests either take in from or release into the atmosphere.

NASA missions utilize an onboard laser altimeter systems to measure the height of our planet, one photon at a time. The advanced technology of ICESat-2 can measure the height of trees and forests all around our planet. **(**

Trees Around the GLOBE Student Research Campaign Metrics

https://www.globe.gov/web/trees-around-the-globe

Year 1: September 15, 2018 – September 14, 2019

8,313 Tree Height Measurements (Students and Citizen Scientists) at 4,490 global sites 7,299 Land Cover Measurements (Students and Citizen Scientists) at 5,366 global sites 7,402 Green Up/Green Down Measurements (Students) from 409 global sites

Year 2: September 15, 2019 – August 31, 2020

13,691 Tree Height Measurements (Students and Citizen Scientists) at 6,079 global sites 8,504 Land Cover Measurements (Students and Citizen Scientists) from 6,059 global sites 5,849 Green Up/Green Down Measurements (Students) from 288 global sites

Year 3: September 1, 2020 – September 21, 2020

691 Tree Height Measurements (Students and Citizen Scientists) at 343 global sites 303 Land Cover Measurements (Students and Citizen Scientists) from 180 global sites 150 Green Up/Green Down Measurements (Students) from 18 global sites

Full Campaign: September 15, 2018 – September 21, 2020

22,695 Tree Height Measurements (Students and Citizen Scientists) at 10,368 global sites 16,106 Land Cover Measurements (Students and Citizen Scientists) at 11,038 global sites 13,401 Green Up/Green Down Measurements (Students) from 492 global sites



Bottom Line: All the above represents just a small amount of GLOBE data students can use for their IVSS projects





September 2020 - November 2020

The Science Highlight the science that correlates to the Trees Around the GLOBE Student Research Campaign. Each month, we will highlight associated science, how to access the GLOBE and mission data aligning to the relevant science, multi-campaigns webinars, and focus on online tools that showcase the science, including GLOBE Vis and ADAT.

December 2020 - February 2021 The Science and Planning Student Research

Phase 1: Highlight how to use the science, data, and online tools from the first 3 months of Year 3 in the development of student research project ideas. We will utilize the "Thematic Overarching Research Question (TORQ), Major sub-questions, and additional questions for research.

Phase 2: Highlight and bring together the collaborative science, data, and student research from the European Phenology Campaign. Mission Mosquito, and the Urban Heat Island Effect - Surface Temperature Field Campaign.

March 2021 - May 2021 Submitting and Presenting Student Research

Highlight the student research that was submitted, as part of the Trees Around the GLOBE Student Research Campaign, to the US SRS and IVSS. Students present their research during the webinars as a teaser for the end of the campaign workshop.

June 2021- August 2021 The Workshop and End of Year 3

In June, there will be a one-two day thematic workshop where students present their GLOBE research projects while interacting with SMEs from NASA and beyond. The themes will be aligned to GLOBE protocols (i.e. Biometry.

July and August will be wrap-up webinars with students, researchers, SME, and citizen scientists.

The Year 3 Scaffold Structure

In order to maximize the information we provide to campaign participants and to provide students the needed content for answering research questions, we will have a Year 3 Scaffold for campaign science, student research and data.

Since September 1, 2020, we now have a quarterly focus for the campaign.







Guiding Questions for Student Research (IVSS)

A Thematic Overarching Research Question (TORQ)

Why are or why aren't there trees in my local environment?



Example Exploratory Research Questions to Help Answer the TORQ

Where are all the trees in your location?

What is the tallest tree in your location?

What type of trees are around me?

What are the environmental conditions around me?

What can historical and current time series of imagery tell you about the trees in your location?

Are trees in your region being impacted by climate change?

The campaign would like student participants to focus on the TORQ, in the sense that this question can be answered by researching some of the following Exploratory Research Questions through looking at existing GLOBE data and utilizing online tools that assist in data visualization, data analysis, and data mapping. In other words, we would like students to answer the TORQ by investigating the example Exploratory Research Questions.

These exploratory questions can serve as a guide to helping students in their research projects. Answering one or more questions can lead to the answering of others.











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The Science of Mapping the Third Dimension – Tree and Canopy Height

A FEW OF THE ASSOCIATED SCIENCE MISSIONS

The **GLOBE** Program





ICESat-2 and GEDI use a technology called Light Detection and Ranging or LIDAR. LIDAR is an active remote sensing technology (the laser version of radar) which uses pulses of laser light to measure 3D structure and height of objects on Earth.



Ice, Cloud, and Iand Elevation Satellite-2 ICESat-2 Global Ecosystem Dynamics Investigation on ISS GEDI

ICESat-2 measurements are made over the Earth's surface between 88° N and 88° S

GEDI measurements are made over the Earth's surface between 51.6° N and 51.6° S







Collaboration with the European Phenology Campaign



What are we asking you to do? When you take a tree height measurement or observation, please take Greenings - Green Up or Green Down (depending on the season) and if possible, identify the genus and species of the tree you are observing.

Why are we asking you to do this? Greenings (Green-Up and Green-Down) measurements help scientists validate satellite estimates of the beginning of the plant growing season in a particular location and by identifying the genus and species of a tree, you can add to the knowledge of global tree distribution.

Comparing the ground-based and space-based data is vital to understanding measurement accuracy and allows for student and professional researchers to build their research using a robust dataset.

The **GLOBE** Program



Measuring Tree Height

GLOBE Hand-Held Clinometer



The **GLOBE** Program

Learn How To Build And Use A Paper Clinometer To Measure Tree Height



https://youtu.be/Ky6KhGLw1AU

Implemented by: 💥 UCAR



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Measuring Tree Height

NASA GLOBE Observer Citizen Science App



https://observer.globe.gov/do-globe-observer/trees

Sponsored by: NASA Supported by:

The **GLOBE** Program







Examples of Online Data Tools for use in Student Research and Data Comparison













Learn More at the Campaign URL:

https://www.globe.gov/web/trees-around-the-globe/

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