National Aeronautics and
Space Administration

# GLOBE Land Cover: Studying our planet one pixel at a time.

## June, 7th 2024

**Peter Falcon**
Earth Science Communications
NASA's Jet Propulsion Laboratory
pcfalcon@jpl.nasa.gov

# Agenda

Let’s go over the following items today. Our goal, to learn about land cover, the GO app and Story Mapping.

**Land Cover/Tree Height Overview**

- The importance of land cover and tree height measurements

**Data (Satellite and GLOBE)**

- Highlight the various data websites that can be used to compare your observations.
- GLOBE Visualization Tool

**GLOBE Observer App (GO)**

- Create a GLOBE Team
- Demo the App (Real time)

**Go Outside and Make Observations**

- Break up into 2 groups and make land Cover and tree observations.
- Discuss problems that arise in taking both measurements.

**Story Mapping**

- How to create Story Maps to present your research findings.
- Discussion and Q&A

## WHY STUDY LAND COVER?

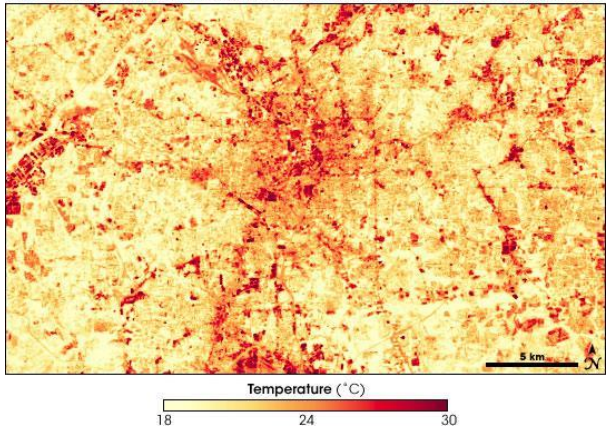
Nearly every aspect of our lives is fundamentally tied to the land on which we live. The homes that shelter us are resting on the land. Farms feed us; forests help to keep us cool, and provide us with oxygen. Rivers and lakes yield fresh water to drink; and different kinds of land cover provide habitats for a diversity of wildlife.

- **Land Cover and the Carbon Cycle:** Land cover change can change the balance of carbon in the system. If a formerly plant-covered area is paved over, then carbon gas is added to the atmosphere and less gas is removed,
- **Land Cover and Ecology:** Many species of animal and plant life depend on their habitat for food shelter and survival.
- **Land Cover and Fire Vulnerability:** Land cover plays a major role in a community's vulnerability to wildfire.
- **Land Cover and Flood Vulnerability:** Land cover influences the way water flows across the land (cement vs soil, wetlands, or forests).

## WHY STUDY LAND COVER ? *cont.*

Nearly every aspect of our lives is fundamentally tied to the land on which we live. The homes that shelter us are resting on the land. Farms feed us; forests help to keep us cool, and provide us with oxygen. Rivers and lakes yield fresh water to drink; and different kinds of land cover provide habitats for a diversity of wildlife.

- **Land Cover and Landslides:** Land cover is a factor in making a slope prone to landslides (removal of trees that anchor soil).
- **Land Cover and the Water Quality:** Water that flows over certain land cover types can pick up pollutants that impact a community's water quality (fertilizers).
- **Land Cover and Temperature:** Plant-covered land is usually cooler than other kinds of land cover. As a result, cities can be as much as 8 degrees warmer than suburban or natural landscapes, a phenomenon known as urban heat island.
- **Land Cover and the Water Cycle:** Land cover plays a role in several aspects of the water cycle. Plants absorb water from the soil and transpire water vapor to the atmosphere.

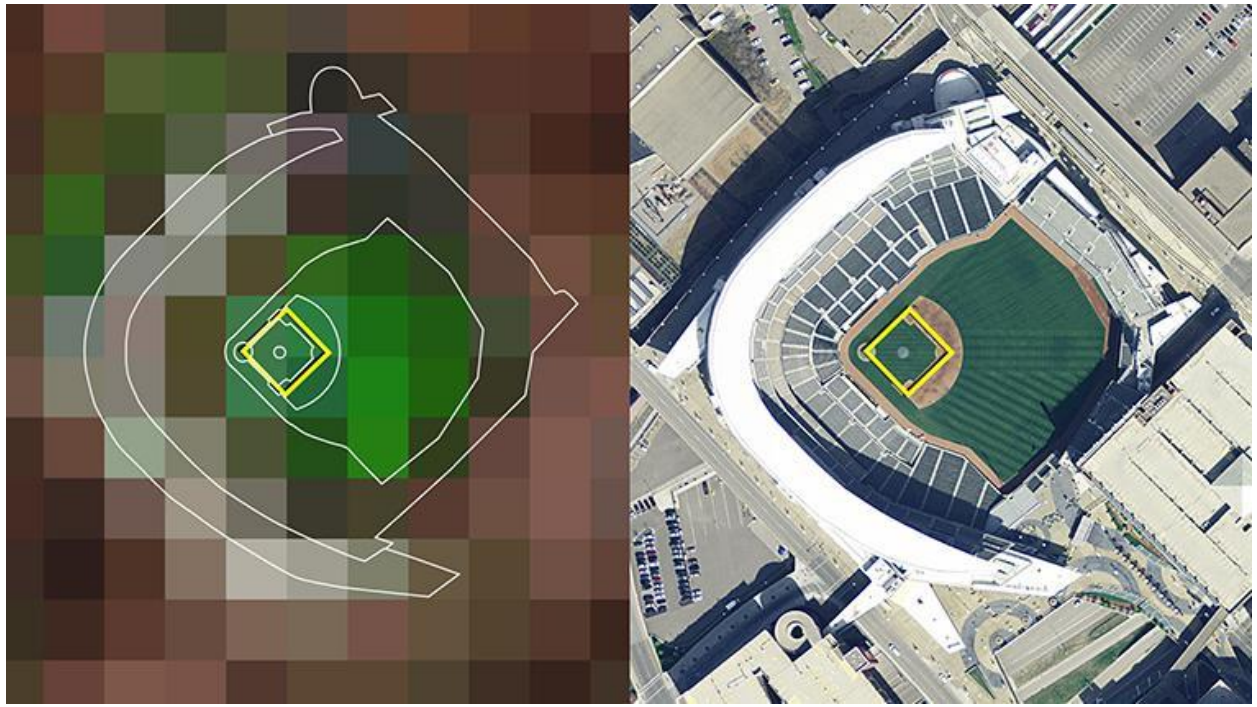


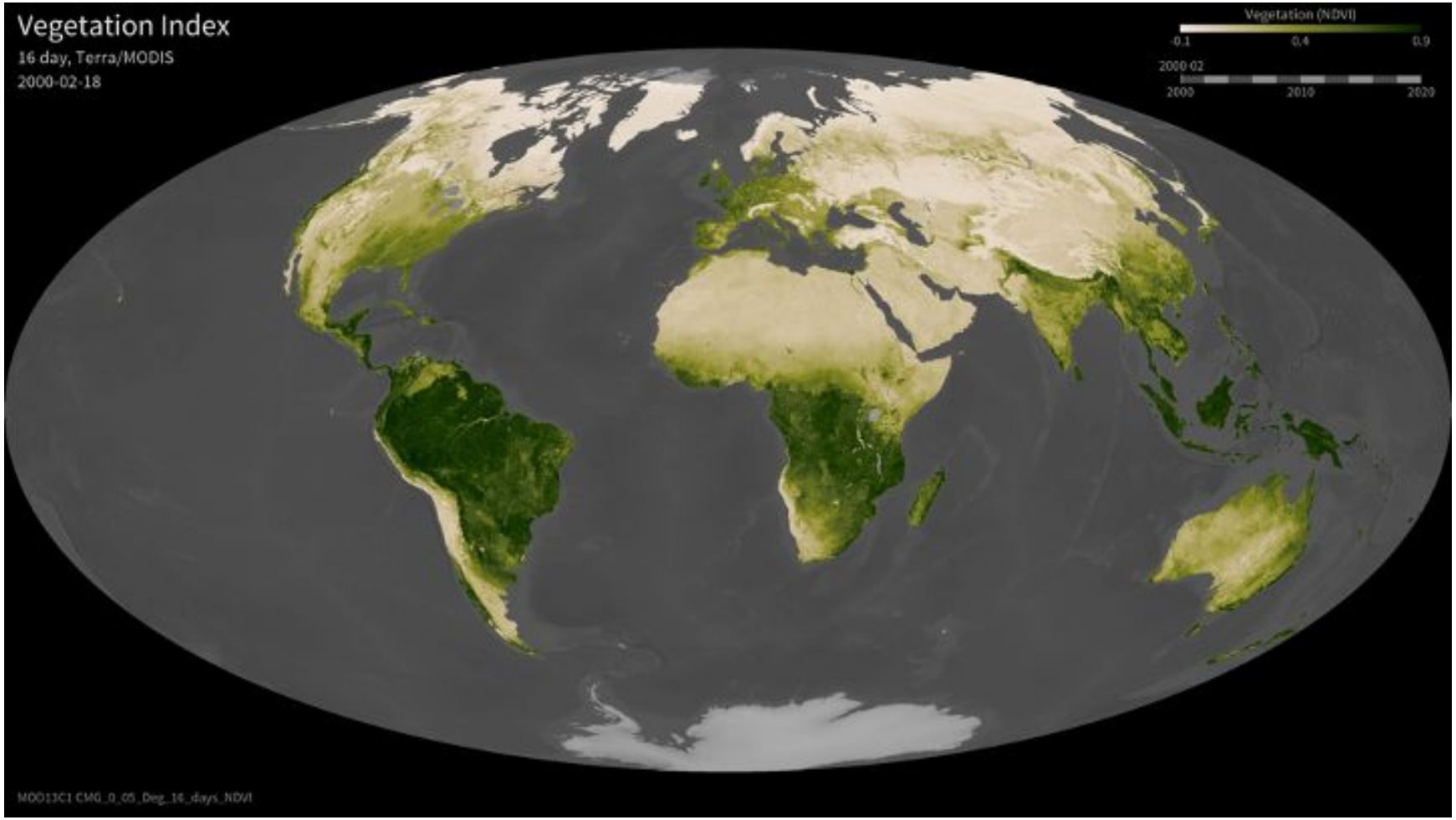
Image source: Landsat

## WHY DO SCIENTISTS STUDY LAND COVER?

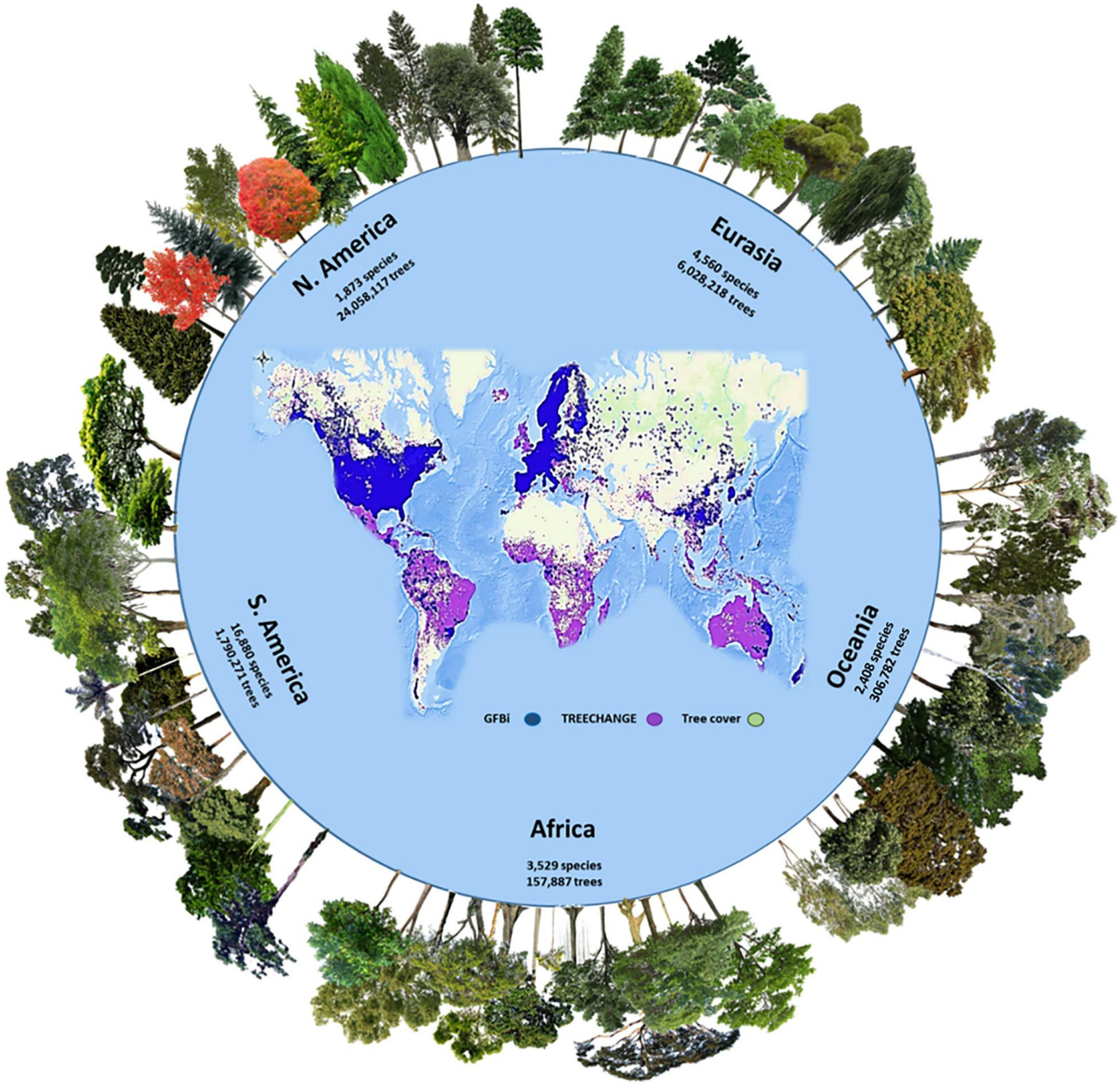
Scientists and land managers must have accurate pictures of the land and how it's changing in order to understand and manage the land. Land cover data gathered by satellites and other means helps provides a big-picture, long-term view. Comparing land cover data from one year to the next helps people evaluate how a community's past land management efforts are working and can provide valuable information on trends to help in planning for the future.

Land cover is part of Earth systems that work together like cogs in an engine.

- Plants covering the land are a critical component of the carbon cycle.
- Land cover influences the water cycle.
- Land cover influences heating and cooling.
- Carbon, water, and energy are part of Earth's climate system. Changes in land cover can contribute to climate change and climate change results in changes to land cover.




https://svs.gsfc.nasa.gov/31053/



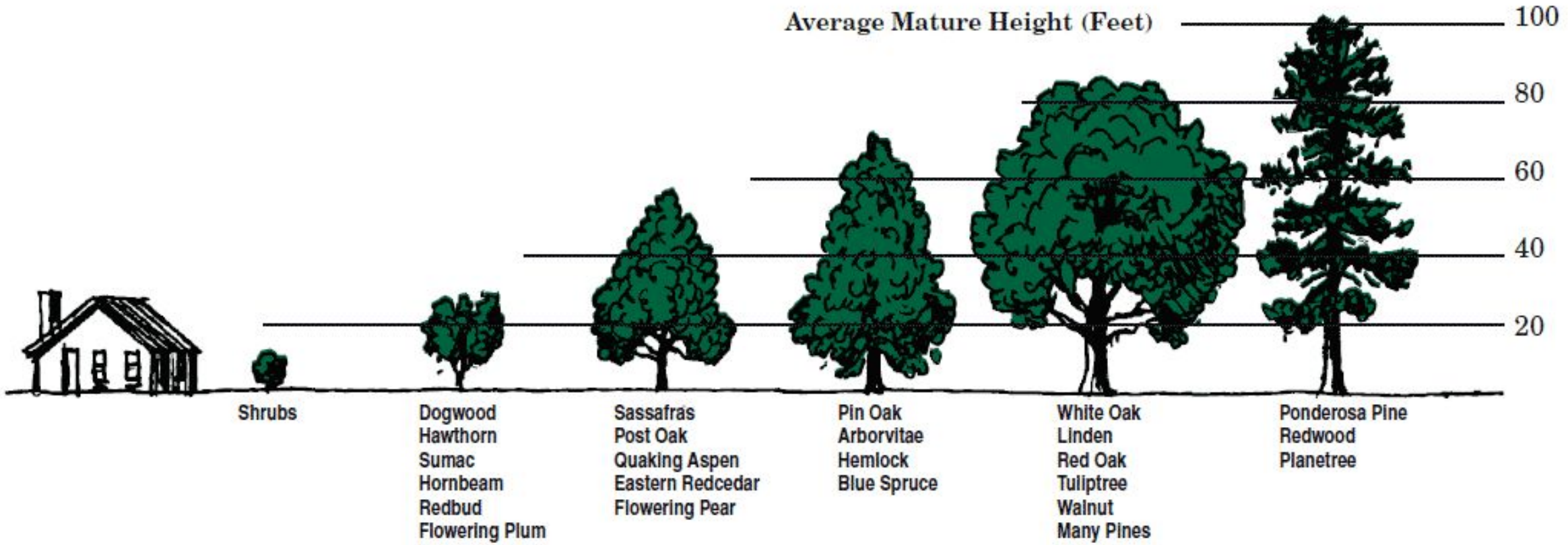

There are 3.03 trillion trees and 78,000 tree species on Earth.

Each tree is an indicator of a changing climate!


# Examples of Types of Trees

- How many of these trees have you seen?
- What is your favorite type of tree?
- Can you guess how many trees there are on Earth right now?
- Can you guess how many different types of trees species there are on Earth?

# Examples of Tree Heights



# Examples of Why Tree Height is Important

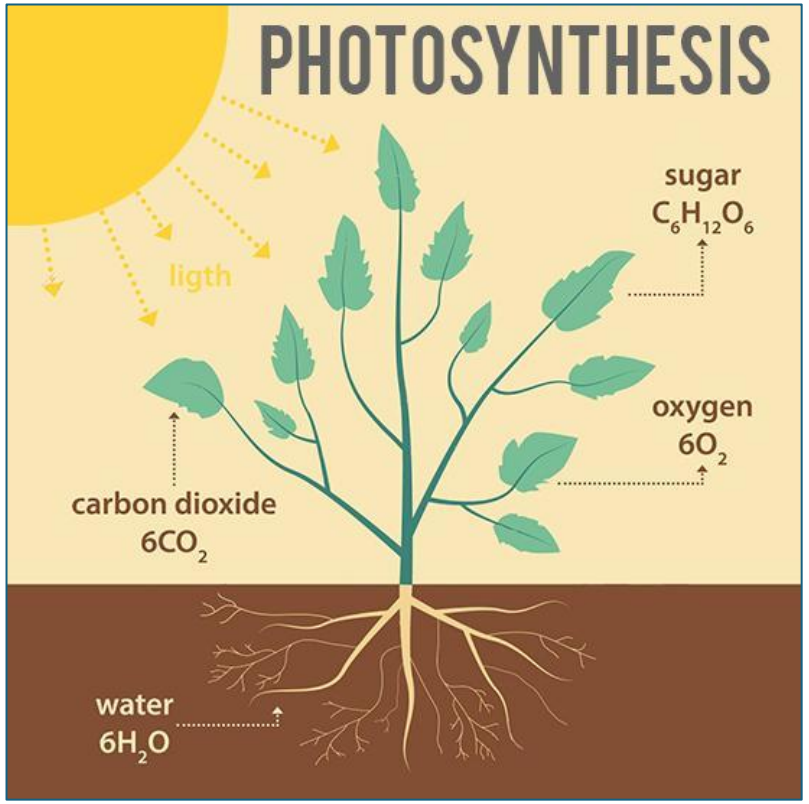
Tree height can not only tell us if the environment around the tree is healthy. But also allows us to track how trees grow over time.

# Trees, Photosynthesis and our Atmosphere

What are trees' role in our atmosphere?

## Carbon Capture and Sequestration

- CC technologies: Pumping CO2 underground, into old coal mines, and aquifers. Can work but very expensive on a large scale.
- Mother Nature has already given us the best cc technology, in the form of forests! Through the process known as Photosynthesis trees and plants, can take in the sun's energy and the atmospheres CO2, bind it to sugar and release oxygen.
- According to the U.S. Forestry Service, America's forest sequester 866 million tons of carbon a year. Roughly 16% of the US annual emissions.



# Trees, Photosynthesis and our Atmosphere

## What are the benefits of trees?

### “Trees are the Lungs of our Planet”

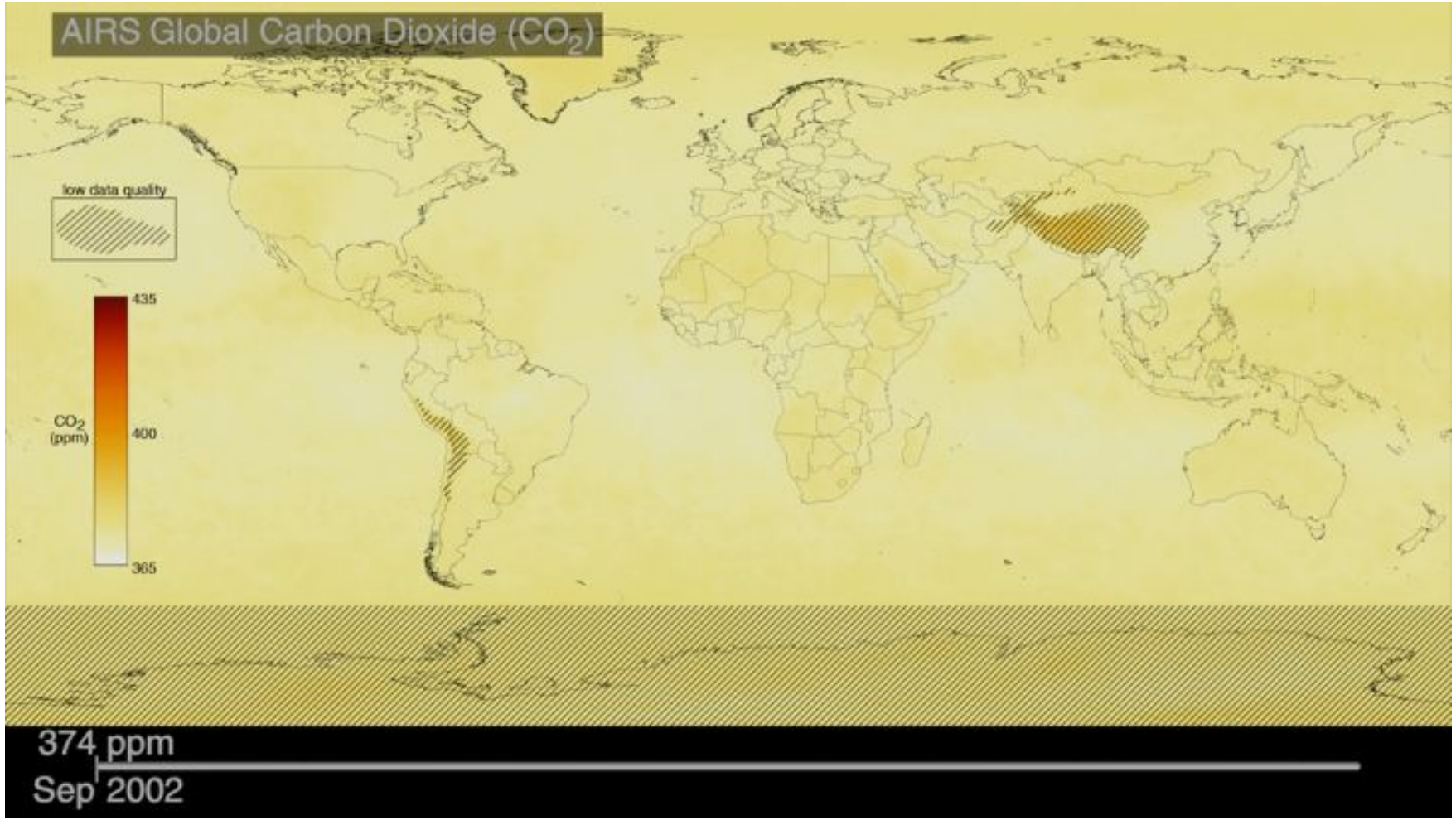
- Trees improve air quality by absorbing pollutants through their leaves.
- Trees improve water quality and reduce flooding and erosion.
- Trees temper climate, trees lower air temperature and humidity. Helping to reduce the urban heat island effect in large cities.
- Trees conserve energy, they can provide cost savings by shading houses from the sun and provide warmth in the winter months when leaves fall.
- Trees create habitat for plants and animals. Wildlife use trees for shelter, bird nesting and food providing for a health ecosystem.
- Trees improve health, they provide a calming effect reducing stress, and providing shade.

# Trees, Photosynthesis and our Atmosphere

## What are the risks of tree lost and deforestation?

### “Trees the Lungs of our Planet”

- Climate imbalance and climate change
- Increase soil erosion, flooding, fewer crops
- Increased greenhouse gases in the atmosphere
- Loss of biodiversity in plants and animals
- Ocean acidification
- Habitat loss for wildlife and possible extinction of some species.
- Food insecurity in the future




https://svs.gsfc.nasa.gov/5025

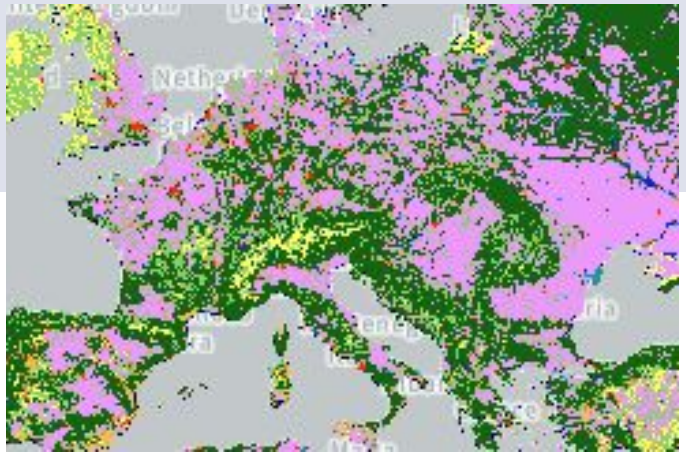
# SATELLITE WEBSITES

## Worldview

**NASA Worldview**: Interactive interface for browsing full-resolution, global, daily satellite images.

**Types of maps**: Access all NASA/NOAA data sets from multiple missions. View historical and current data as well as natural disasters.

https://worldview.earthdata.nasa.gov



## Copernicus

**Copernicus Europe's eyes on Earth**: who work directly at or for a NASA facility

**Types of maps**: All, including land cover, agriculture-crop-development, biodiversity, plus a catalogue of data maps.

https://land.copernicus.eu/en

https://www.copernicus.eu/en


## Earth Engine Apps

**Google Earth Engine Apps**: Dynamic, publicly accessible user interfaces for Earth Engine analyses.

**Types of maps**: View maps on forests, trees, land cover and more.

https://glad.earthengine.app

# GLOBE Observer App

Before we go out lets do a couple of things.

- Verify the GO app is downloaded & updated
- Verify you can login
- Launch your app and join the team I created:
  - Referral Code: **GLIDF7J5** (GLOBE Slovakia)
- Once you joined, check and see if your name or screen name is listed on the team page.
  - https://www.globe.gov/web/globe-slovakia
- Complete the tutorials for the Land Cover and Tree Height protocols (at least the first 2 of land cover).

# Let's Go Outside and Make Some Measurements!

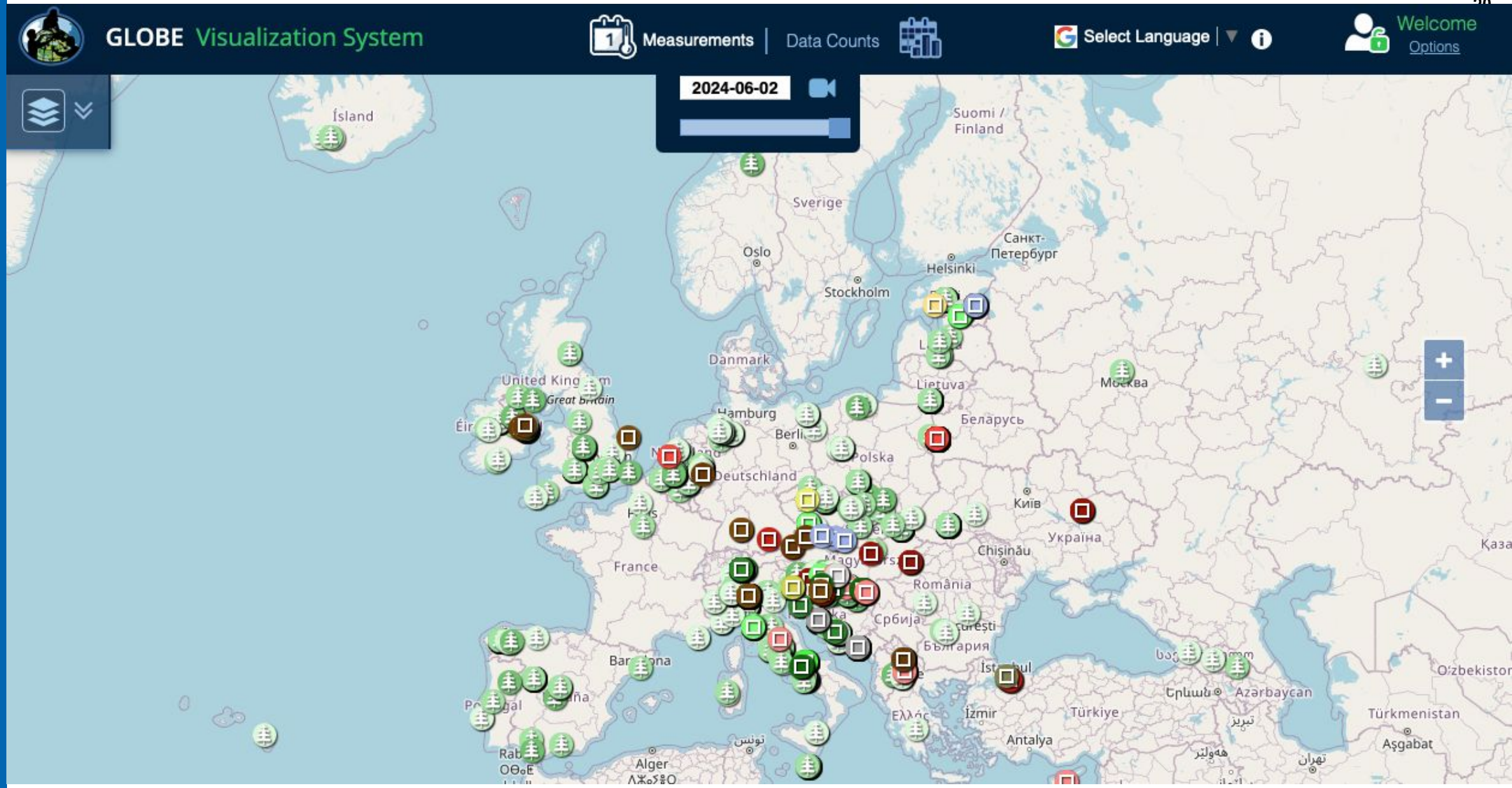
1. We'll break up into 2 groups.
   a. Land Cover
   b. Tree Height

2. Let's measure the same tree(s) to see how accurate the app is…don't forget to input your height and height of the phone at eye level! Select Metric.

1. Things to note
   b. Is the ground leading to the tree flat?
   c. Will everyone have the same exact outcome?
   d. What are somethings that can confound are results?
   e. Discuss any difficulties you may have experienced.

# And We’re Back.
# Discussion, Questions?

# GLOBE VISUALIZATION TOOL




https://vis.globe.gov/GLOBE/

# What Do Scientists do with your Data?

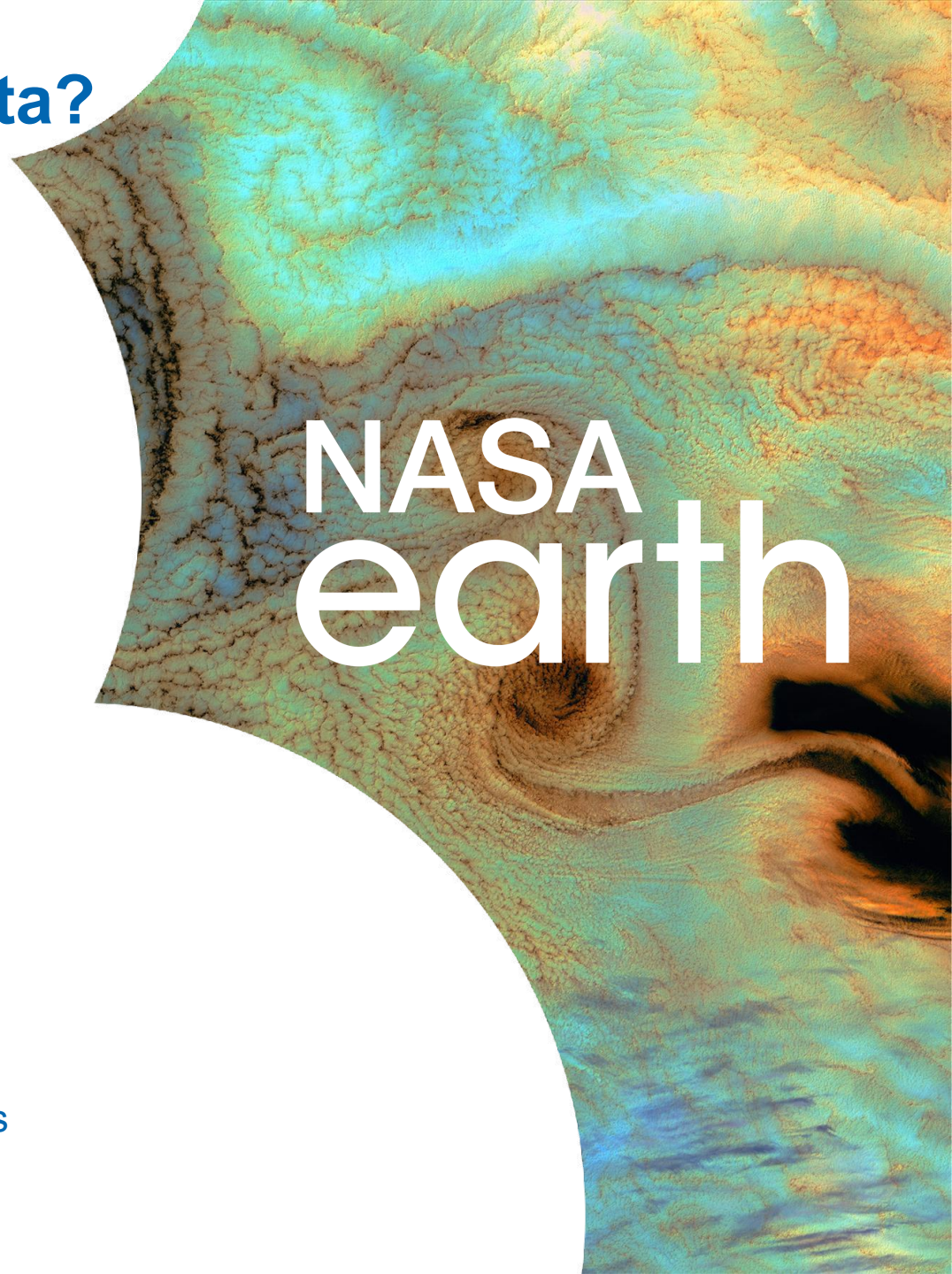
These questions often come up by students.

"*What happens to our data after we make measurements"?*

*"Do scientists really use our data"?*

The answer to both is YES!

- Scientists from NASA and universities use your data to (potentially) help ground truth satellites, and provide data gaps when satellites are not over head.
- They use your observations to write scientific papers. over 1,000 have been published using student and citizen scientists observations (so far).
- They do conference presentations, both oral and poster and in some cases professional development workshops with educators (teachers).



# ArcGIS StoryMaps

"Harness the power of maps to tell engaging stories".

**What are Story Maps?:** Storymaps are interactive digital stories that use embedded content. They can contain data maps, multimedia (videos, photos, audio clips, audio narratives), and text.

**Why StoryMaps?:** Produce dynamic interactive presentations using features and themes not found in powerpoint presentations. You're stories can educate, create awareness, and change in your communities.

**ArcGIS Resources:** Here are two sites to visit to learn more about Storymaps.

1. StoryMaps.com
2. StoryMap Examples

NASA

# earth

science.nasa.gov/earth

Your Home. Our Mission.

GLOBE Observer Data 2019-2024