Phenology & Carbon Cycle

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Four learning activities on carbon cycle and trees that we prepared for Phenology Camapign teachers and students:

1. **Tree Growth Game**
2. **Carbon Around Me**
3. **Carbon in My Tree**
4. **The Case of Missing Carbon**

https://www.globe.gov/web/european-phenology-campaign/overview/download-materials

Which one is the carbon cycle?

Source: http://cycle.yorkshire.com/

This is the Carbon Cycle!

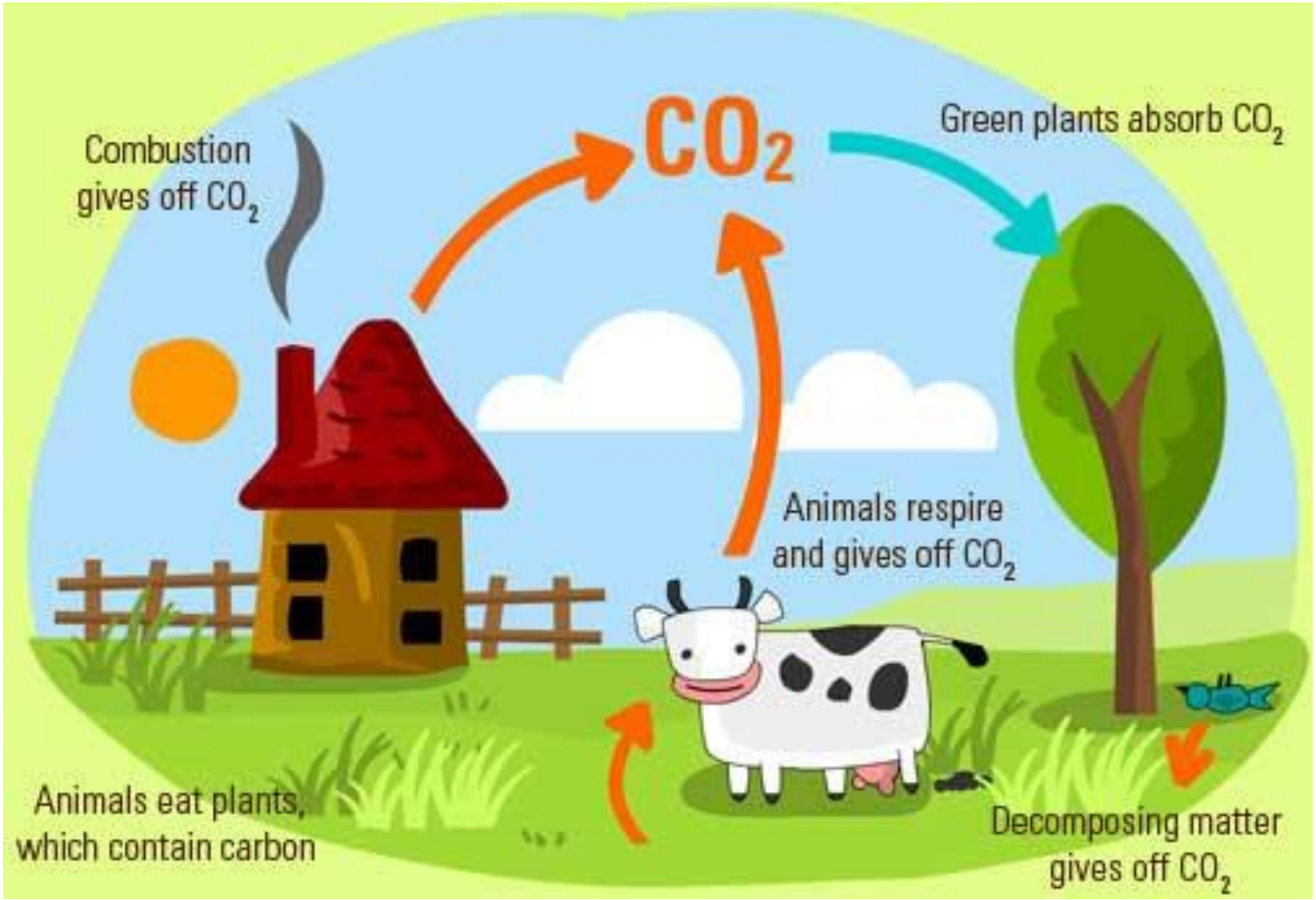


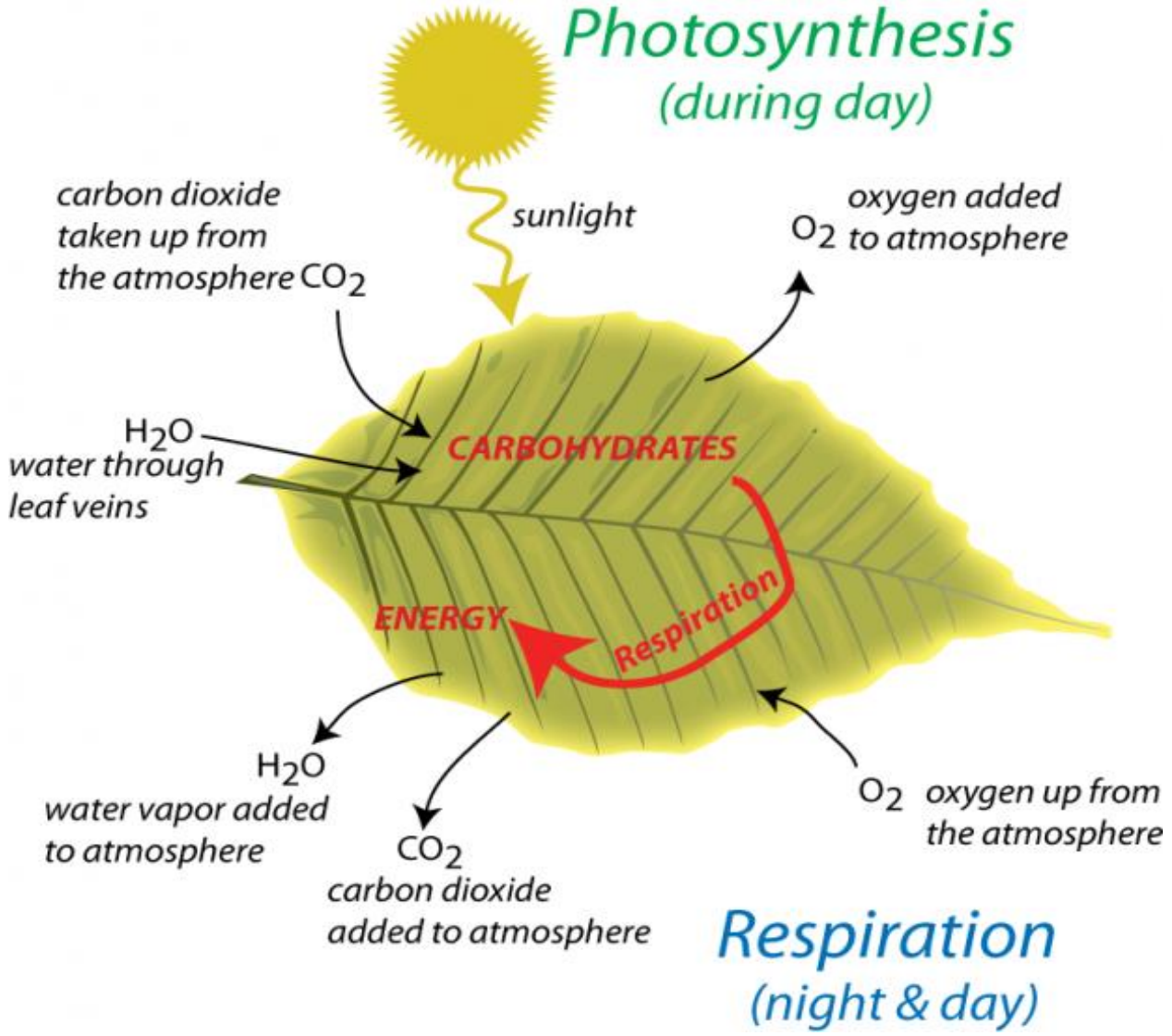
Image source: http://eschooltoday.com/our-ecosystems/the-carbon-cycle.html

Why do we talk about Carbon Cycle in connection to trees?

The Magic of Plants

The most effective solar panel!

Transforms the energy from sun to a chemical energy.



Source: course Earth in the Future, PennState, https://www.e-education.psu.edu/earth103/node/1020

Carbon in Trees

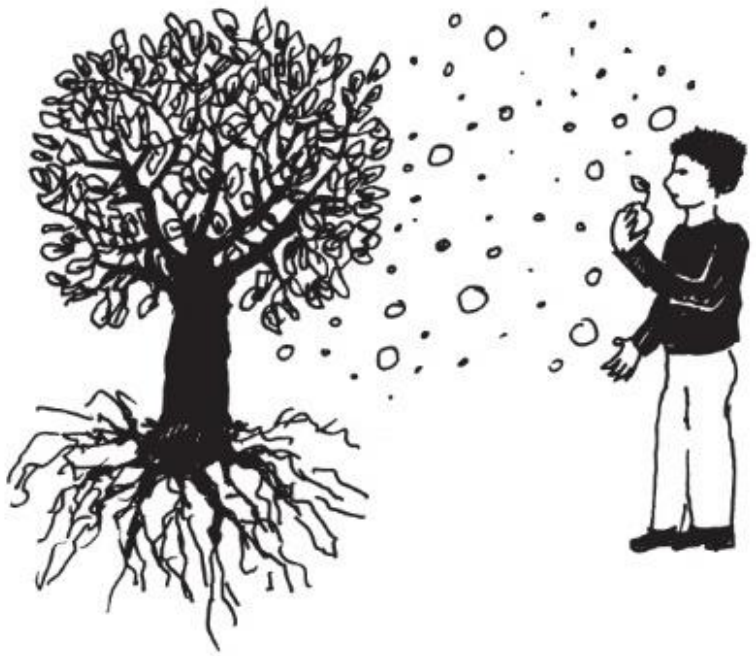
- Trees bind a large amount of carbon dioxide and water.

carbon dioxide + water + energy from the Sun → glucose + oxygen

= photosynthesis

- Carbon is transformed into leaves and wood.

→ Activity 1: Tree Growth Game



Carbon Activities

by

Kinasivska secondary school of I-III degrees, Ukraine

Example of students work: https://www.globe.gov/web/european-phenology-campaign/overview/get-inspired

Where else can you find carbon?

Carbon is everywhere!

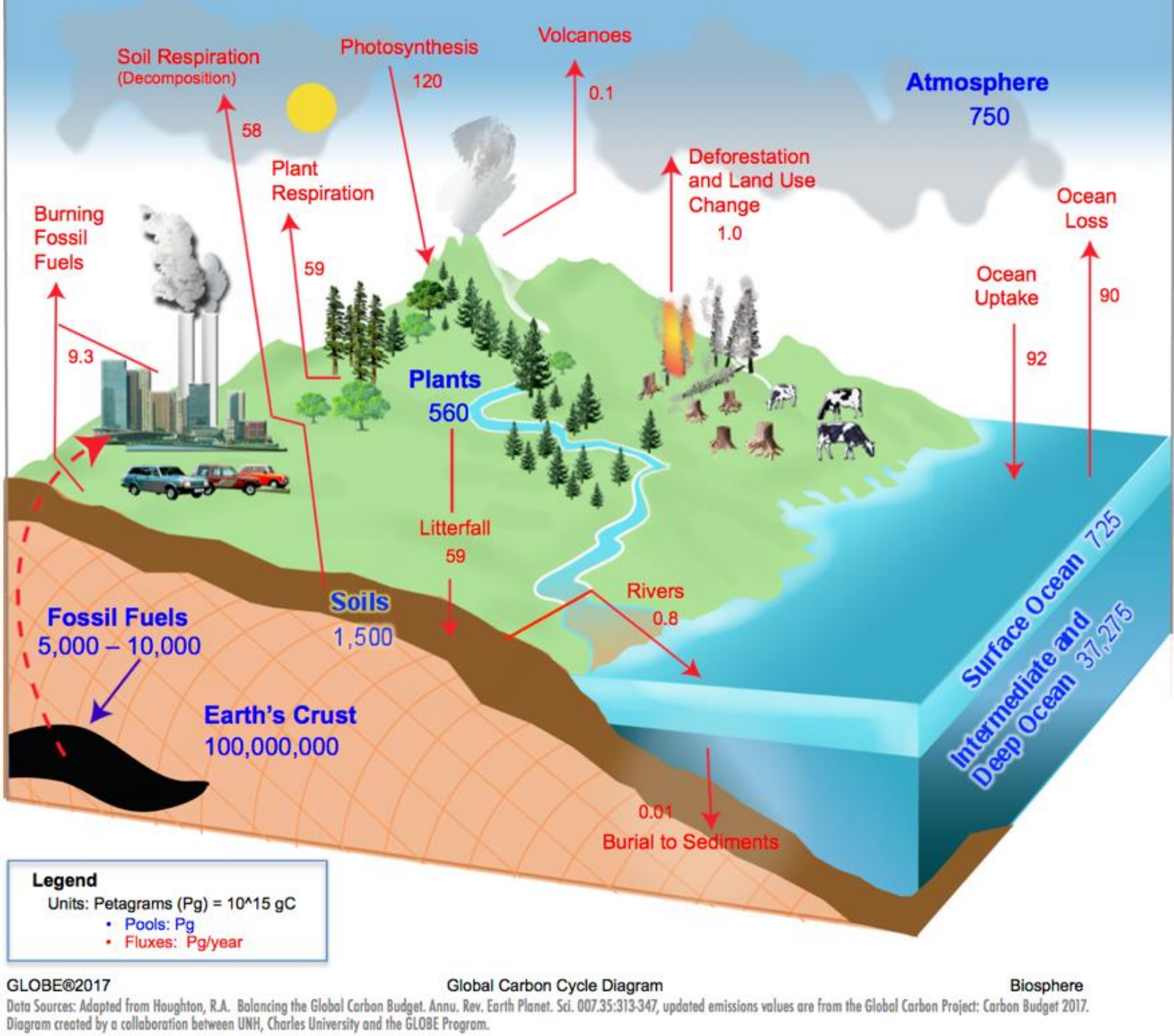
- Carbon
  - basic building block of life - 45-50% of the total mass of the biosphere
  - everywhere on Earth - stored in ocean, atmosphere and crust

- Cycle of carbon
  - key regulator of Earth's climate system
  - central to ecosystem function – food chains…

- the movement of carbon between Earth's spheres
- fluxes / pools

Think about carbon sources, fluxes, pools in your area

→ activity 2: Carbon Around Us




CARBON RELEASE
CARBON UPTAKE
OUR SCHOOL

Carbon in a Life of a Tree

NASA visualisation: https://svs.gsfc.nasa.gov/vis/a010000/a010000/a010006/index.html.

Carbon in a Life of a Tree

- The CO_2 balance (carbon intake vs. release) changes over tree life cycle.
  - Young tree - a natural carbon storage because of the massive carbon intake
  - Adult mature tree - the carbon stored in the wood increases very slowly
  - Aging tree - the CO_2 balance comes close to zero
  - Dead tree - carbon gradually released to the soil and into the air.

Calculate how much carbon is stored in your tree.
→ activity 3: Carbon in My Tree

What time of the year a tree builds in the biggest amount of carbon into its biomass?

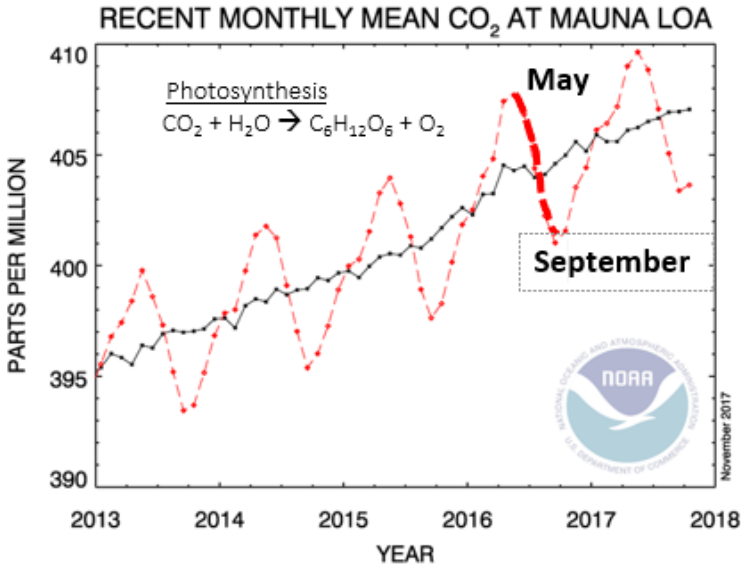
Role of Trees in Global Carbon Cycle

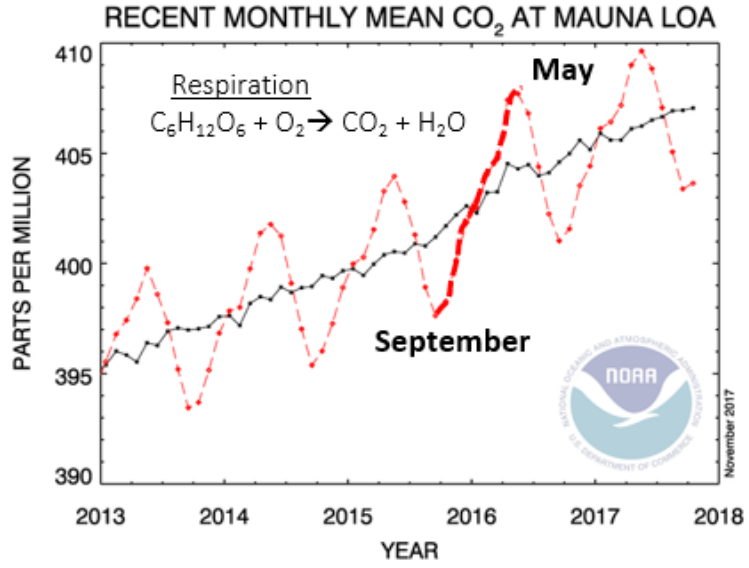
- CO_2 level oscilation corresponds with the “green wave” in vegetation of the northern hemisphere
  - **spring-summer: biosphere takes up more CO_2 than it releases**
  - **autumn-winter: biosphere releases more CO_2 to the atmosphere than it absorbs**

- **Forests keep amount of carbon in balance** - exchange carbon between air, plants, animals and soil
- **Trees of the northern hemisphere** influence carbon cycle of the whole planet

Watch how CO_2 concentration and vegetation cycles captured by satellites change over time

→ activity 4: The Case of Missing Carbon





European Phenology Campaign

- Webinars
- Download Materials
- Get Inspired
- Community
- News and discussion
- Our Measurements
- My Tree grows under Covid-19
- GrowApp
- Autumn 2020
- Contacts

Download Materials

activities I field guides I e-training I protocols I GLOBE data tutorials I lesson plans

- 2021 Spring Campaign Flyer - basic information about the campaign
- Presentation
- GLOBE 365 Poster - there is a place to stick photos of your tree as well! If you want to receive a hard copy of the poster, contact your GLOBE country coordinator.
- Winter twigs - a key to recognising buds
- Why do the leaves change color? - learn why and how the autumn change of trees happens.

Activities for students

Spring

Activity 1: My Tree + carbon activity: Tree Growth Game

Activity 2: Look at the Buds + Data Sheet + Carbon Around Me

Activity 3: First Leaves + carbon activity: Carbon in my tree

Activity 4: My Green Up Data + Data Upload Guide + carbon activity: The Case of Missing Carbon

Activity 5: Green Color Scale

Resources

- Phenology Campaign: www.globe.gov/web/european-phenology-campaign
- E-trainings: www.globe.gov/get-trained/protocol-etraining/etraining-modules/16867717/3099387
- Protocols: www.globe.gov/do-globe/globe-teachers-guide/biosphere?p_p_id=globegovteacherguideportlet_WAR_globegovcmsportlet_INSTANCE_4CcA&_globegovteacherguideportlet_WAR_globegovcmsportlet_INSTANCE_4CcA_protocolCat=2513263#13326840
- GLOBE Elementary: www.globe.gov/web/elementary-globe/overview/seasons
- GrowApp: www.growapp.today
- NASA videos and animations (see the links on each slide) and NASA Earth Observatory: https://earthobservatory.nasa.gov/

THE GLOBE PROGRAM

Thank you!

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www.globe.gov/web/european-phenology-campaign

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How Much Carbon do Plants Take from the Atmosphere?

1. Watch the video: https://earthobservatory.nasa.gov/global-maps/MOD17A2_M_PSN

2. What we see on the video

The greener the color, the bigger amount of CO2 is built in by plants in that time of the year.

net primary productivity = how much CO2 vegetation takes in during photosynthesis minus how much CO2 the plants release during respiration

The data come from (MODIS) on NASA's Terra satellite. Values range from near 0 grams of carbon per square meter per day to 6.5 grams per square meter per day (dark green).

A negative value means that more carbon was released to the atmosphere than the plants took in (due to decomposition or respiration)

3. Compare to what you see on this video: https://www.youtube.com/watch?v=x1SgmFa0r04