My NASA Data - GLOBE Connections

GLOBE Connections: Sea and Land Ice Melt

This resource helps to identify and access GLOBE protocols and hands-on learning activities that complement the Sea and Land Ice Melt phenomenon. Students can conduct their own investigations and see how their data related to global patterns by using GLOBE and My NASA Data together.

Visit the **GLOBE Cryosphere Protocols & Related ESDE Datasets** page that outlines the datasets available in the Earth System Data Explorer. These data complement student GLOBE investigations using the following protocols.

Sea and Land Ice Melt

Students can use GLOBE protocols to study changing temperatures, permafrost and fresh water ice.

Protocols

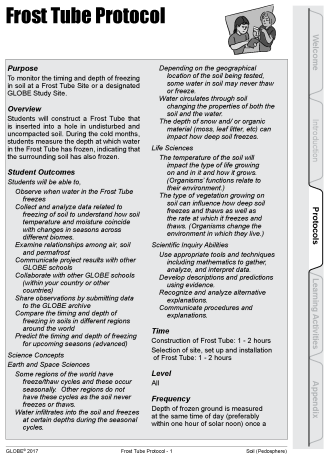
GLOBE protocols can be used to collect many types of data to explore the conditions related to formation and melt of sea and land ice. Students use the protocols to collect data and share their data with other GLOBE students around the world.

Source: [GLOBE Website]

Freshwater Ice Phenology

The purpose of the Freshwater Ice Phenology Protocol is to monitor the freeze-up and breakup processes on a selected pond/lake or large creek/river to determine the duration of the annual ice cover. Students select an easily accessible pond/lake or large creek/river close to their school that is known to develop an ice cover in the winter and observe and document its freeze-up and break-up.

Frost Tube


Frost Tube Protocol

Purpose
To monitor the timing and depth of freezing in soil at a Frost Tube Site or a designated GLOBE Study Site.

Overview
Students will construct a Frost Tube that is inserted into a hole in undisturbed and uncompacted soil. During the cold months, students measure the depth at which water in the Frost Tube has frozen, indicating that the surrounding soil has also frozen.

Student Outcomes
Students will be able to,
- Observe when water in the Frost Tube freezes
- Collect and analyze data related to freezing of soil to understand how soil temperature and moisture coincide with changes in seasons across different biomes.
- Examine relationships among air, soil and permafrost.
- Communicate project results with other GLOBE schools
- Collaborate with other GLOBE schools (within your country or other countries)
- Share observations by submitting data to the GLOBE archive
- Compare the timing and depth of freezing in soils in different regions around the world
- Predict the timing and depth of freezing for upcoming seasons (advanced)

Science Concepts
Earth and Space Sciences
- Some regions of the world have freeze/thaw cycles and these occur seasonally. Other regions do not have these cycles as the soil never freezes or thaws.
- Water infiltrates into the soil and freezes at certain depths during the seasonal cycles.
- Depending on the geographical location of the soil being tested, some water in soil may never thaw or freeze.
- Water circulates through soil changing the properties of both the soil and the water.
- The depth of snow and/ or organic material (moss, leaf litter, etc) can impact how deep soil freezes.

Life Sciences
- The temperature of the soil will impact the type of life growing on and in it and how it grows. (Organisms' functions relate to their environment.)
- The type of vegetation growing on soil can influence how deep soil freezes and thaws as well as the rate at which it freezes and thaws. (Organisms change the environment in which they live.)

Scientific Inquiry Abilities
- Use appropriate tools and techniques including mathematics to gather, analyze, and interpret data.
- Develop descriptions and predictions using evidence.
- Recognize and analyze alternative explanations.
- Communicate procedures and explanations.

Time
Construction of Frost Tube: 1 - 2 hours
Selection of site, set up and installation of Frost Tube: 1 - 2 hours

Level
All

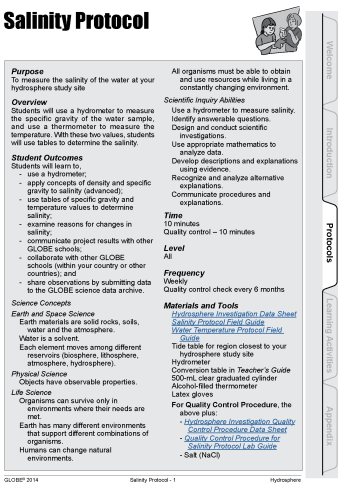
Frequency
Depth of frozen ground is measured at the same time of day (preferably within one hour of solar noon) once a

GLOBE® 2017 Frost Tube Protocol - 1 Soil (Pedosphere)

Welcome Introduction Protocols Learning Activities Appendix

Students construct a Frost Tube that is inserted into a hole in undisturbed and uncompacted soil. During the cold months, students measure the depth at which water in the Frost Tube has frozen, indicating that the surrounding soil has also frozen.

Salinity (Including Titration)



Salinity Protocol

Purpose
To measure the salinity of the water at your hydrosphere study site

Overview
Students will use a hydrometer to measure the specific gravity of the water sample, and use a thermometer to measure the temperature. With these two values, students will use tables to determine the salinity.

Student Outcomes
Students will learn to,
- use a hydrometer;
- apply concepts of density and specific gravity to salinity (advanced);
- use tables of specific gravity and temperature values to determine salinity;
- examine reasons for changes in salinity;
- communicate project results with other GLOBE schools;
- collaborate with other GLOBE schools (within your country or other countries); and
- share observations by submitting data to the GLOBE science data archive.

Science Concepts
Earth and Space Science
Earth materials are solid rocks, soils, water and the atmosphere.
Water is a solvent.
Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).
Physical Science
Objects have observable properties.
Life Science
Organisms can survive only in environments where their needs are met.
Earth has many different environments that support different combinations of organisms.
Humans can change natural environments.
All organisms must be able to obtain and use resources while living in a constantly changing environment.

Scientific Inquiry Abilities
Use a hydrometer to measure salinity.
Identify answerable questions.
Design and conduct scientific investigations.
Use appropriate mathematics to analyze data.
Develop descriptions and explanations using evidence.
Recognize and analyze alternative explanations.
Communicate procedures and explanations.

Time
10 minutes
Quality control – 10 minutes

Level
All

Frequency
Weekly
Quality control check every 6 months

Materials and Tools
Hydrosphere Investigation Data Sheet
Salinity Protocol Field Guide
Water Temperature Protocol Field Guide
Tide table for region closest to your hydrosphere study site
Hydrometer
Conversion table in *Teacher's Guide*
500-mL clear graduated cylinder
Alcohol-filled thermometer
Latex gloves
For **Quality Control Procedure**, the above plus:
- Hydrosphere Investigation Quality Control Procedure Data Sheet
- Quality Control Procedure for Salinity Protocol Lab Guide
- Salt (NaCl)

Welcome | Introduction | Protocols | Learning Activities | Appendix

GLOBE® 2014 Salinity Protocol - 1 Hydrosphere

Ice melt can impact the salinity of the ocean water. Students measure the salinity of a salty or brackish water sample using a hydrometer and thermometer.

Learning Activities

Check out the three learning activities to help prepare students for collecting data and to support the integration of MND with *GLOBE* in your curriculum.

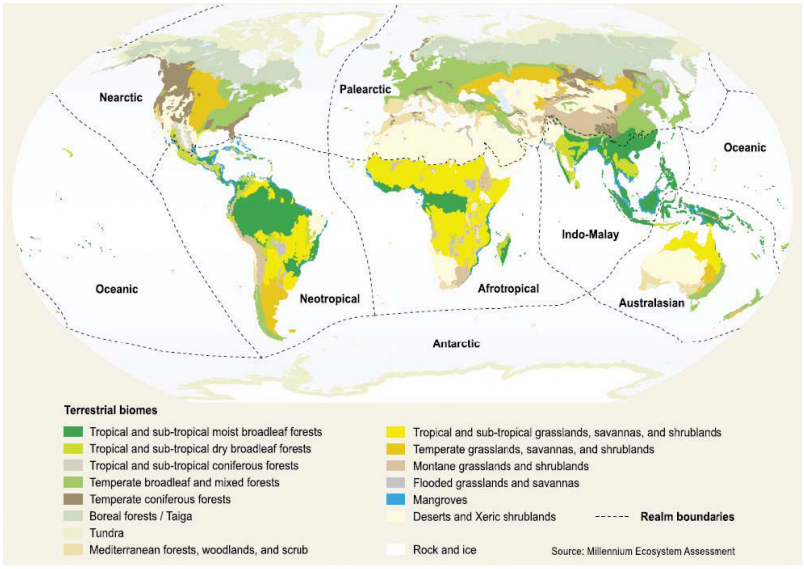


Figure 1. The global distribution of the eight biogeographic realms and the 14 major biomes. Original source for Map: D.M. Olson et al. 2001

Source: [GLOBE Getting to Know Your Terrestrial Biomes]

[Getting to Know Your Terrestrial Biomes]

Students become familiar with the Terrestrial Biome Classifications that the Seasons and Biomes project has adopted.

Student Outcomes:

- Use appropriate sources of information
- Synthesize data from different sources to create a coherent description of the main biomes
- Identify appropriate sources of information
- Organize data into tables
- Draw conclusions by synthesizing a variety of data
- Communicate results and explanations

[How to Make a Climograph from Your Local Weather Data](#) 

Purpose: Students assemble, analyze and graph the long-term air temperature and precipitation data for their general area, to understand the difference between weather and climate.

Student Outcomes:

- Weather is a day-to-day phenomenon and climate is a long-term average of weather
- The sun is the major source of energy for changes on the Earth's surface
- Organisms' functions relate to their environment
- Sunlight is the major source of energy for ecosystems
- Identify appropriate data sources
- Perform simple statistical calculations
- Organize data into tables and graphs
- Use appropriate tools and techniques
- Draw conclusions by synthesizing a variety of data
- Communicate results and explanations

Sources:

GLOBE Website

Image Credit: GLOBE