My NASA Data - GLOBE Connections

GLOBE Protocol Bundle: Soils

Soils

Soils and their function within an ecosystem vary greatly from one location to another as a result of many factors, including differences in climate, animal and plant life, and the type and age of the soil.

The purpose of the **Soil Bundle protocol** is to provide greater knowledge on the relationship between soil characteristics and their function for different ecosystems. (*Source: GLOBE Soils Protocol Bundle*)

The GLOBE database provides data submitted by individuals for specific protocols which can be used in investigations. In addition, there are additional data available in the My NASA Data Earth System Data Explorer. These data can provide context and background information or provide data for additional locations. There are also data for additional parameters not included in GLOBE.

When investigating soil, there are many interrelated variables that can be explored through the Earth System Data Explorer. Some of these are directly related to a GLOBE protocol which is part of the soil protocol bundle. Others are indirectly related. The data sets below have been identified as those that can complement these investigations. The specific GLOBE protocols used in the bundle can be found in the section below the related Earth System Data Explorer data sets section.

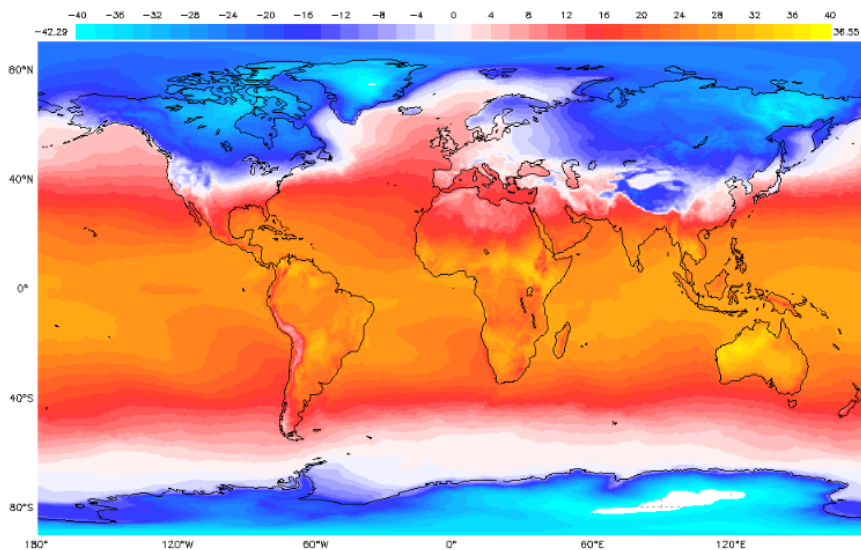**Related Earth System Data Explorer data sets:**

Explore the MND GLOBE Connections Datasets spreadsheet to review the range of datasets available to integrate with GLOBE Protocol Bundle research by visiting the **link**.

GLOBE Protocol & Protocol Bundles and Related Earth System Data Explorer Datasets

Sphere/Data Set	Air Quality	ENSO	Mosquitos	Oceans	Rivers and Lakes	Soil	Urban	Water Cycle	Water Quality	Weather
Atmosphere										
Monthly Water Vapor in the Atmosphere	X	X	X	X	X	X	X	X	X	X
Daily High Cloud Coverage	X	X	X	X	X	X	X	X	X	X
Daily Low Cloud Coverage	X	X	X	X	X	X	X	X	X	X
Daily Total Cloud Coverage	X	X	X	X	X	X	X	X	X	X
Daily Surface Air Temperature	X	X	X	X	X	X	X	X	X	X
Daily Middle Cloud Coverage	X	X	X	X	X	X	X	X	X	X
Daily Precipitation Amount	X	X	X	X	X	X	X	X	X	X
Monthly Aerosol Optical Depth	X			X						
Monthly Air Column Concentration of CO	X									
Monthly Air Column Concentration of NO2	X									
Monthly Air Column Concentration Anomaly of NO2	X									
Monthly Air Column Concentration of SO2	X		X	X	X				X	
Monthly Albedo Measured from Space										
Monthly Concentration of CO2 in Troposphere										
Monthly Low Cloud Coverage	X	X	X	X	X	X	X	X	X	X

Dataset Recommendations and Rationale:

Air and surface temperature data sets allow students to explore daily and monthly average temperatures and anomalies. Surface temperatures are directly related to soil temperatures at the surface.

- **Daily Surface Air Temperature**
- **Monthly Surface Air Temperature**
- **Monthly Surface Air Temperature Anomaly**
- **Monthly Daytime Surface (Skin) Temperature**
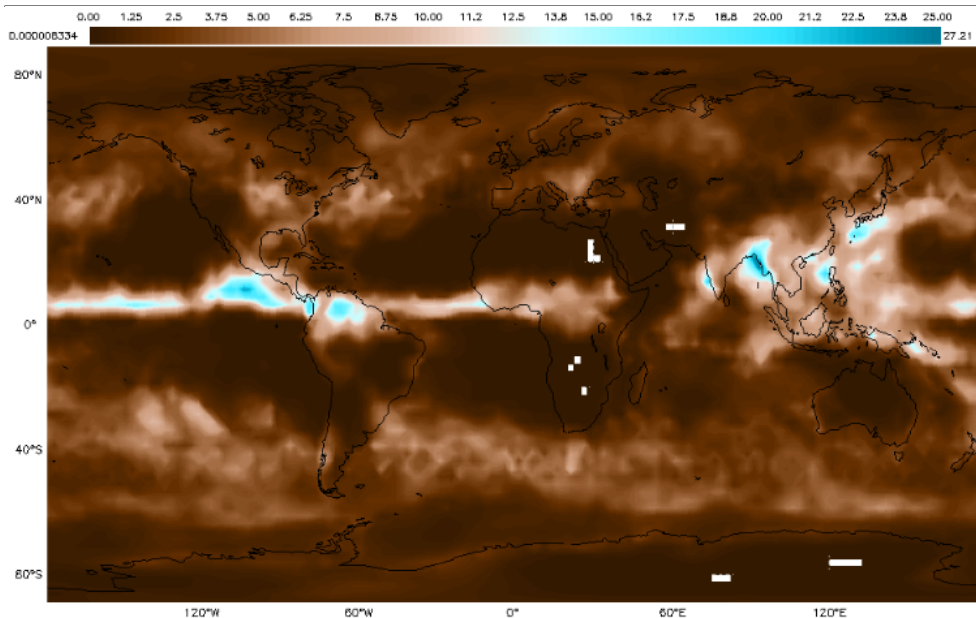- **Monthly Nighttime Surface (Skin) Temperature**

Earth System Data Explorer - Monthly Surface Air Temperature - February 2019

Precipitation can influence soil and soil moisture. These data are complemented by cloud data and water vapor data.

- **Daily High Cloud Coverage**
- **Daily Low Cloud Coverage**
- **Daily Mean Relative Humidity**
- **Daily Middle Cloud Coverage**
- **Daily Total Cloud Coverage**
- **Monthly Low Cloud Coverage**
- **Monthly Total Cloud Coverage**
- **Monthly Water Vapor in the Atmosphere**
- **Daily Precipitation Amount**
- **Monthly Average Precipitation Rate**

Earth System Data Explorer - Monthly Precipitation - June 2018

Soil fertility will relate to the vegetation that can grow in an area.

- **Monthly Leaf Area Index**
- **Monthly Normalized Difference Vegetation Index**

GLOBE Protocols Included

- Atmosphere
    - Air Temperature - Measure the current air temperature when an instrument shelter is not available. Current air temperature is measured using a thermometer held in the open air but in the shade for at least 3 minutes.
    - Precipitation (including pH) - To determine the amount of moisture input to the local environment by measuring rain and snowfall and to measure the pH of precipitation.
    - Relative Humidity - Students measure the relative humidity using either a digital hygrometer or a sling psychrometer.
- Biosphere
    - Land Cover Classification - Students locate, photograph, and determine the MUC class for 90 m x 90 m areas of homogeneous land cover.
- Hydrosphere
    - Nitrates - Students will measure the nitrate/nitrogen content of water using a nitrate test kit.
    - pH - Students will measure the pH of the water using either pH paper or a pH meter.
- Pedosphere (Geosphere)
    - Bulk Density - Students will measure the mass of a dry soil sample of known total volume including pore space to determine the density of the whole sample.
    - Soil Fertility - Students will use a GLOBE Soil Fertility Kit to prepare samples and determine whether nitrate, phosphate, and potassium are absent from a soil sample or present in low, medium or high concentrations.
    - Soil Infiltration - Students will use a dual ring infiltrometer that they can construct from large food container cans to measure the rate at which water soaks into the soil during a roughly 45-minute period.
    - Soil Moisture (Gravimetric): Students will measure soil water content by comparing the

wet and dry masses of samples.

- ◦ [Soil pH](#) - Students will prepare a one-to-one mixture of dry soil and distilled water and then measure the pH of the liquid left after most of the soil has settled to the bottom of the mixture.
- ◦ [Soil Temperature](#) - Students will measure near-surface soil temperature frequently near local solar noon and seasonally throughout two diurnal cycles.