

Did you know that soil observations are critical for understanding climate change?

Soils are key players in the Earth's climate system: they **absorb, store and release carbon and water.**

54 Essential Climate Variables

are vital for understanding the climate; these include **soil carbon and soil moisture.**

Why are soil properties measured? How are they measured?

What are the challenges and opportunities?



Soil Carbon

Soils are the **second largest carbon sink**, with about **3 times as much carbon** as the atmosphere. **Organic soil carbon** largely comes from plants, which fix atmospheric CO₂. It is measured by analyzing the **carbon content** of soil samples. These samples can be combined with soil maps to provide a map of soil carbon estimates.

Changes in soil carbon stocks can be tracked through process models or a bookkeeping approach monitoring carbon stocks in living vegetation, dead plant material, wood products and soils.



Soil Moisture

Soil moisture controls plant growth, evaporation, groundwater recharge, and runoff generation. It helps us understand the **water, energy and biogeochemical cycles**. Observing and quantifying relevant fluxes helps us understand and predict **climate change impacts** on **ecosystems and agriculture**, and **reduce uncertainties in climate projections.**

In situ observations are used to calibrate **satellite observations**, which can provide a **global estimate of soil moisture.**



Depending on the region, climate change may result in more carbon being stored in plants and soil, or more carbon being released into the atmosphere.



Regular and accurate estimates of soil carbon and its fluxes are needed to support climate change mitigation and adaptation efforts.



Under densely forested areas or over deserts, satellite instruments are unable to provide adequate measurements for soil moisture. GCOS is encouraging improvements to better understand the process and various climate feedbacks.