

→ THE ESSENTIAL CLIMATE VARIABLES: WHAT DO WE MEASURE FROM SPACE?

Most Earth-observing satellites complete one orbit of the Earth in just 100 minutes. This low-Earth orbit allows the whole world to be covered in a matter of days to weeks. The resulting rapid accumulation of data, collected in a consistent way, has led to some major advancements in climate science.

To name a few: the detection of the acceleration of ice loss from the Greenland and Antarctic ice sheets; the details of regional trends in sea level rise and how it's affected by ocean currents, the discovery of the hole in the ozone layer, and changes in land cover over time.

These satellite measurements, together with other independent observations, combine to provide the evidence for climate change. These strands of evidence all add up to an overall picture of a complex, interlinked climate system.

We need measurements of all parts of it – from the land, ocean and atmosphere – to make sure our knowledge of the climate is complete. Scientists have therefore compiled a list of the key components of the Earth that need to be measured in order to monitor different aspects of climate change. The result was a list of 50 **Essential Climate Variables**.

The European Space Agency has committed to producing data sets of Essential Climate variables through its Climate Change Initiative programme. The programme focuses on the variables that it can best cover using ESA satellite data, which are currently:

ATMOSPHERE

Aerosols, Clouds, Ozone, Greenhouse Gases (carbon dioxide and methane).

OCEAN

Sea Level, Sea Surface Temperature, Ocean Colour, Sea Ice

LAND

Land Cover, Fire, Soil Moisture, Ice Sheets (Greenland and Antarctica), Glaciers

The Climate Change Initiative is the largest coordinated programme for developing data sets on Essential Climate Variables. It involves around 200 people in 89 institutions across Europe, including universities research organisations, government agencies and industry.

Data from the programme provides us with a powerful tool to monitor one of the most pressing environmental concerns of the 21st century and will help predict the effects that a changing climate may bring.