

Geodesy: Measuring a changing Earth

Precise observations reveal how our planet moves, deforms, and changes over time.

The Earth is constantly changing

Geodesy provides the measurements that allow us to detect, understand, and quantify these changes. By observing the shape, gravity field, rotation, and motion of the Earth, geodesy provides essential information about processes occurring within and between the Earth's components: the geosphere, atmosphere, hydrosphere, cryosphere and biosphere.

What does geodesy help us monitor?

Earth Dynamics

Crustal deformation, tectonic plate motion, earthquake-induced displacements, and volcanic activity.



Oceans and Sea Level

Sea-level change, ocean circulation, and changes in ice sheets and glaciers.



Land and Water

Land subsidence, uplift, inland water bodies, groundwater variations, and changes in the cryosphere.



Atmosphere

Water vapour, electron content, and disturbances driven by space weather.



Climate and Earth System Change

Long-term changes in the solid Earth, oceans, ice, and atmosphere.



Geodesy makes Earth system change measurable

Geodesy combines observations from satellites, GNSS, gravity missions, tide gauges, altimetry, and terrestrial networks to create a consistent, global picture of how our planet is changing. Its measurements provide the reference frame and quantitative evidence needed to connect observations across space and time, and to distinguish natural variability from long-term change.

*Accurate observations → Understanding Earth processes → Better prediction
→ Informed decisions.*

To understand a changing Earth, we first need to measure it.

Through the *International Association of Geodesy (IAG)* and its *Global Geodetic Observing System (GGOS)*, the global geodetic community works together to provide the measurements, reference systems, services, products and essential geodetic variables that help science and society understand our changing Earth and build a safer, more resilient world.



<https://geodesy.science/ggos/>