

What is gravimetry?

Gravity is often associated with falling apples and the geophysical discipline of gravimetry has Sir Isaac Newton (1643 - 1727) to thank for this! Apples allegedly helped Newton formulate his Law of Universal Gravitation, the law states that the attraction between two masses is proportional to the product of these masses and inversely proportional to the separation between the masses. Apples adhere to this law in the same way that satellites orbiting the Earth do.

Gravimetry deals with the force of attraction of bodies towards the Earth. Today gravimetry is as much a part of geophysics as it is geodesy. Whereas research in geodesy focusses on defining the figure (shape) of the Earth, in geophysics the focus is more on the Earth's internal density distribution. Geodesy is particularly focussed on the definition of the external gravity field of the Earth and the establishment of global networks of survey points that act as a reference system for positioning and mapping. In geophysics, differences in gravity measured on land, at sea, in the air and in space provide insight into the Earth's internal density distribution. Density variations inferred from gravity measurements are used in petroleum and mineral exploration and also in large-scale studies of the Earth's tectonic plates and their margins, crustal uplift after melting of ice or the distribution of mass in large sedimentary basins on land or at sea.

Quantitative three-dimensional models, built using modern computer methods, provide insight into the geometry and rock density of the whole Earth or specific bodies of scientific or economic interest. Gravity differences related to geology are generally very small and must be measured with extreme precision using sensitive instruments called gravimeters. These instruments can be used to make absolute (pendulum or falling-mass instruments) or relative (spring gravimeter) gravity measurements. In more recent years, individual gravity-field components can be measured and this has led to the emergence of gravity gradiometry. Gravity measurements are passive. No fields are induced and gravimeters are used to directly measure differences in the gravity field from place to place.