

Geothermal

Geophysical Exploration

Geophysical exploration plays a very important role in geothermal exploration. Various physical parameters are measured, such as resistivity, density, sound velocity and magnetism of the subsurface rocks.



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Resistivity surveys, as carried out by Iceland GeoSurvey, yield important information on physical properties of geothermal systems. Temperature dependent assemblies of secondary minerals are formed by water-rock interaction (alteration) in the geothermal systems resulting in a very distinctive resistivity structure that can be used to map the size and shape of the reservoirs.

Monitoring and locating micro earthquakes gives information on fault movements and permeability as well as heat mining from heat sources and tomography inversion give information on sound velocity anomalies. Gravity surveys can give information on density variations such as dense intrusions. Magnetic measurements can be used to locate dikes and give information on demagnetization due to alteration.

A joint interpretation of complementary data (geophysical, geological and geochemical) is the crucial last stage in geothermal exploration.

Iceland GeoSurvey offers the following geophysical services for geothermal exploration and other applications:

▶ **Resistivity surveying**

Transient ElectroMagnetic (TEM) and MagnetoTelluric (MT) soundings. State of the art processing and interpretation of data including joint 1D inversion of TEM and MT for static shift correction of MT, 2D and 3D inversion. DC resistivity (Schlumberger soundings and head-on profiling).

▶ **Micro seismicity**

Setting up and operating local seismic networks, both permanent and temporal. Analyses of passive seismic data for determining hypocentres, magnitudes, focal mechanisms and tomography inversion.

▶ **Gravity and geodetic surveying**

Gravity surveys both for rock density studies (Bouguer) and high precision micro gravity surveys for reservoir monitoring. High precision differential GPS and GNS surveying along with gravity surveying and for monitoring crustal movements. State of the art data processing and interpretation.

▶ **Magnetic surveying**

Total magnetic field surveys on surface.

▶ **Active seismic methods in engineering geology**

Both seismic refraction and seismic reflection surveys for structural and engineering purposes with explosive or airgun energy sources. State of the art 2D data processing and interpretation.