HISTORY AND EVOLUTION OF MAGNETIC METHODS IN THE EARTH SCIENCES

Magnet which is an attractive property of a mineral lodestones and a naturally occurring form of magnetite .The earliest observation of a magnet was known in the 300 b.c by the Chinese and in the 19th century the power flow of a magnet was know to move from one pole to another (north –south). This magnet which the Chinese use to build a compass out of lodestones before the 1000 a.d, they developed a suspended and pivoted needle compass and in (1522-1606) William Gilbert recognized the behaviour of the earth noting that the earth naturally behaves like a magnet the law proceeds the law of gravitation while in 1785 Charles Augustin de coulomb established the law of inverse square (repulsion and attraction).while in 1872 James clerks Maxwell derived sets of equation that quantifies all the known relationships between the coulombs, ampere's, faradays ,Lenz ,ohms laws) .the origin which includes the discovery of the study of physical origin of magnetism and is practically fundamental to the study of earth sciences especially geophysics.

Earth sciences, which is the study of geology and its sub disciple, e.g. surveying, exploration, and also the origin of the earth and its solar system. This studies all consist of geophysical methods which brought about the relationship of using magnets in the study of the earth .the instruments used in studying the earth sciences is called the magnetometer which includes the following gauss (hall effect), zero balance, quartz horizontal, asatic, fluxgates, crygenic (squid) magnetometers. The squid which is the most recent of all the above mentioned magnetometer, consist of more than one or more Josephson junction (this which is a zone of weak magnetic coupling between two region of super conducting materials) as a magnetic field, while the gauss or hall effects magnetometer is the first known magnetometer used in the study of earth sciences, and was built in 1832.

The relationship of magnetometer or the materials used in the study of earth sciences, i would discuss specifically. In the study of the solar system researchers from direct observation of extra terrestrial magnetic fields, had to

mount magnetometers in the spacecraft which record's directly, intensity of interplanetary magnetic field as well as the magnetic field around several other planets most this data has being obtained from either a passing or orbiting spacecraft. In surveying the magnetic compass is used to determine horizontal direction of movement or bearing of an object or deposition, in its actual concept, its usually used to describe the region of the earth's crust that have unusual anomalous magnetization which can be related to local mineralisation which is of commercial interest or could be due to subsurface structures that have bearing on the location of mineral deposits, this methods of surveying is best carried out from an aircraft, this which helps to get information faster and better ,and this magnetic anomaly develop over rocks and is more magnetic than the neighbouring rocks and could be caused by circulation pattern in the earth core and by variation in the directions of rock magnetism. In paleomagnetism, which involves in the trace of the origin of the earth using magnetism, it helps also in the reconstructing of the earth 's continents, although the records of earlier magnetic field intensity and direction were inferred from archeomagnetism, (which is the study of geomagnetic field of artifacts from dateable historical records). The magnetism is preserved in rocks of iron bearing minerals, tectonic related magnetism altering the original magnetization affecting the original direction further assumption of paleomagnetism is the natural remanent magnetization of the rock, this which was acquired at rock formation or at a known time and remains unaltered the measurement of remanent magnetization is done with the use of asatic magnetometer which have fallen into disuse and modern latest measurement are spinners and squid magnetometer

.paleomagnetism helps in determining local and regional tectonism and also the earth's lithospheric plates. In exploration which comprises of basin studies, stratgrphic study (magnetostratigraphy) and seismic survey involves the elementary knowledge of geophysical method, in basin studies its used to differentiate the basement complexes from the sedimentary terrain showing magnetic anomalies, while in seismic data the use of magnet is also use to record information through the geophones which is a magnetic film property which stores data. Magnetostratigraphy tells you of the core studies of measuring directional magnetization in smaller sample of different dept in the core, although deep-sea core has vertical axes that are not oriented in azimuth so it's inclination can only be determined relatively to an arbitrary references value and polarity determination, and are based on inclination records of which the boundaries between normal and reversed megnetozone are interpolated at depth where inclination is zero. Magnetic data of lava's and sediments acquire their magnetization in different mechanisms the thermoremanent magnetization is obtained from the cooling down of magma while the depositional or postdepostional remanent magnetism in sediments is acquired slowly at a constant ambient temperature either during\after deposition, (primary\secondary respectively) the sediments magnetostratigraphic polarity yields also the absolute age of the first\last appearance datum of key fossils given absolute dates for paleontological fossil zones and also tell you the thickness of the bed while in igneous rock lava is extruded in a molten state which solidifies and it's temperature cools below curie temperature of the magnetic mineral. In oceanography magnetic anomalies can be observed also. Earlier observation of the

pacific ocean of the west north American by marine geophysicts discovered large areas of oceanic crust characterized by long stripes of alternating positive and negative anomalies, seismic studies indicates layered structures from the ocean as the floor of the ocean which lies at depth of about 2-5km underlained by seismic layer 1 which are sediment of variable thickness and after that a distance of 0.5km is underlained by seismic layer 2a (basaltic extrusion and shallow intrusion) underlained again by deeper layers of the oceanic crust know as the seismic layer 2b and 3 consisting of dikes and gabbros respectively. The seismic layer 2a sufficiently account for the magnetic anomalies measured in the oceanic surface although the anomalies may arise in the deeper gabbros (seismic layer 3).

Finally the above discussed magnetic methods in the study of earth sciences has really helped in the discovery of the earth's mineral resource.