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What is an Airborne Geophysical survey?

An airborne geophysical survey is executed from an aircraft using a magnetometer that can be carried on board or towed behind the aircraft and measures the physical properties of rock formations. Common properties investigated include magnetism, specific gravity, electrical conductivity and radioactivity. An airborne geophysical survey can be followed up by a ground geophysical survey.

What is an Electromagnetic survey?

More commonly referred to as an EM survey, it is a geophysical survey method which measures the electromagnetic properties of rocks. An alternating current is fed into a wire coil held in a prescribed direction, either parallel or perpendicular to the ground surface. This current produces an alternating magneticfield, which induces a current in any nearby electrical conductors. The method detects conductive bodies, not mineralization. A conductor could be an economic deposit of metal sulphides, but also could be a zone of conductive graphite. VLF (very-low-frequency) is one method of EM, which uses the signals from marine-navigation radio stations as a primary field source. Because EM surveys do not require electrical contact with the ground, they are among the most useful techniques in airborne geophysics and are usually followed up by ground EM work.

What is an Induced Polarization (IP) survey?

A method of ground geophysical surveying employing an electrical current to determine indications of mineralization. An electrical current is sent through the ground and the surfaces of metallic minerals become charged. An over voltage has to be applied to drive the current across these barriers. When the current is switched off, the over voltage decays – in other words, there is a brief storage of energy that can be measured even after the current is switched off. The IP effect is particularly useful in detecting disseminated sulphide minerals, which may be economic in themselves or may serve as pathfinders to other mineral deposits.

What is a Resistivity survey?

A geophysical technique used to measure the resistance of a rock formation to an electric current. An Electric current is generated and forced into the ground from widely spaced electrodes. The current flows through the earth to complete the circuit, and the amount of current that flows depends on the resistance the rock offers. A conductive orebody containing economic metallic sulphides will cause an anomalously low resistance. Resistivity and IP are normally done as a single survey.

What is a Gravity survey?

A Gravity survey measures the gravitational attraction of the earth. The force of gravity is not uniform over the whole surface of the earth; it is actually slightly stronger where the underlying rocks are more dense, and slightly weaker where they are less dense. The difference is tiny, but it can be measured and mapped. Gravity surveys use extremely sensitive balances to detect the variations in density of the underlying rocks. They can be useful in conducting a rapid reconnaissance (initial) survey of an area to delineate major rock types. This information can help to indicate areas favorable to exploration by other methods i.e. IP, EM, Resistivity etc. It can also be used in more detailed exploration to detect mineral deposits, which are commonly denser than the rocks that surround them.

What is a Radiometric survey?

A radiometric ground survey detects the presence of radioactive elements through use of electronic equipment These instruments measure the energy released during the process of radioactive decay. As a uranium molecule decays three kinds of rays are given off: alpha, beta and gamma rays. The most advanced electronic equipment can distinguish between radiation of the three main radioactive elements that occur in nature – uranium, potassium and thorium – by measuring the energy of the radiation. Ground radiometric surveys are used to detect the showing of radioactive minerals directly, whereas, airborne radiometric surveys are used for geological mapping because radioactive elements are more common in granitic rocks.

What is Ground Penetrating Radar (GPR) survey?

GPR is a nondestructive geophysical method that produces a continuous cross-sectional profile or record of subsurface features, without drilling, probing, or digging. Ground penetrating radar profiles are used for evaluating the location and depth of buried objects and to investigate the presence and continuity of natural subsurface conditions and features.Ground penetrating radar operates by transmitting pulses of ultra high frequency radio waves (microwave electromagnetic energy) down into the ground through a transducer or antenna. The transmitted energy is reflected from various buried objects or distinct contacts between different earth materials. The antenna then receives the reflected waves and stores them in the digital control unit.The depth of penetration of GPR is highly site specific and is limited by attenuation of the outgoing pulse. The GPR system is more effective in seeing through insulators to conductors. Greater penetration is obtained in dry, sandy, and rocky soils and little penetration is obtained from moist, clayey conductive soils. Penetration generally ranges from one to ten metres although penetrations of more than 30 metres have been achieved under certain ideal conditions.

What is a Satellite Imagery survey?

Geologists have used aerial photographs for decades to serve as databases from which they can do the following: pick out rock units (stratigraphy), study the expression and modes of the origin of landforms (geomorphology), determine the structural arrangements of disturbed strata (folds and faults), evaluate dynamic changes from natural events (e.g., floods; volcanic eruptions), seek surface clues (such as alteration and other signs of mineralization) to subsurface deposits of ore minerals, oil and gas, and groundwater. Function as a visual base on which a geologic map is drawn either directly or on a transparent overlay.

With the advent of space imagery, geoscientists now can extend that use in three important ways: 1) The advantage of large area or synoptic coverage allows them to examine in single scenes (or in mosaics) the geological portrayal of Earth on a regional basis, 2) The ability to analyze multispectral bands quantitatively in terms of numbers (DNs) permits them to apply special computer processing routines to discern and enhance certain compositional properties of Earth materials, 3) The capability of merging different types of remote sensing products (e.g., reflectance images with radar or with thermal imagery) or combining these with topographic elevation data and with other kinds of information bases (e.g., thematic maps; geophysical measurements and chemical sampling surveys) enables new solutions to determining interrelations among various natural properties of earth phenomena.

While these new space-driven approaches have not yet revolutionized the ways in which geoscientists conduct their field studies, they have proven to be indispensable techniques for improving the geologic mapping process and carrying out practical exploration for mineral and energy resources on a grand scale.