First digital version of the Aero-Magnetic Map of Cuba

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Introduction

The first digital version of the Aero-Magnetic Map of the Republic of Cuba was compiled and reprocessed in collaboration with the Cuban Institute of Geology and Paleontology and Scintrex Limited, Canada (Scintrex-Caribe Joint Venture). The challenge of combining magnetic data acquired at different time and platforms was achieved by employing comprehensive processing techniques, bringing data to modern standards. The map represents a valuable tool for exploration companies evaluating prospective areas and planning for detail target-oriented projects.

Survey Specifications

The map was compiled from magnetic data collected during nineteen (19) airborne geophysical surveys carried out between 1979-1990. Flat areas were surveyed by fixed wing platforms while mountain areas were surveyed by helicopters. In both platforms, the principal sensor was a proton precession magnetometer of 1nT sensitivity. Data were sampled at 1 second intervals. Ground base-station magnetometers were implemented on each survey to remove diurnal variations.

Mean terrain clearance of the magnetometer sensor was 60 meters. Traverse line spacing was 500 meters (fixed-wing collection) and 250 meters (helicopter collection).

For the fixed-wing surveys, aircraft navigation and positioning was by visual navigation using topographic maps and aerial photographs. GPS navigation was implemented for the higher resolution helicopter surveys flown between 1987-1990 over mountain areas.

Data Compilation

The majority of data, originally stored in digital tapes readable by mainframe computers, were converted into disks readable by available micro-computers. Using an in-house technique, the swamp area of Ciénaga de Zapata which represents about 8% of the map, was digitized from a previous large-scale Magnetic Anomalies Map prepared in 1962.

Data processing

To level data acquired at different time, a regional magnetic value was removed based on the International Geomagnetic Reference Field (IGRF) model of 1986 (Barraclough, 1987). Adjoining survey blocks were merged together. Reprocessed data included micro-leveling and the removal of spurious noise employing the Fast Fourier Transformation (FFT) algorithm implemented in the Geosoft data processing software (see Geosoft technical note). Data was then re-gridded using a cell size of 125 meters.

For presenting a unified map, grids that belong to the second half of the country from the centre to the east projected into the Cuba-Sur projection were reprojected into the Cuba-Norte projection. The first digital version was released in 1995 (Figure 1) at 1:2,000,000 scale.

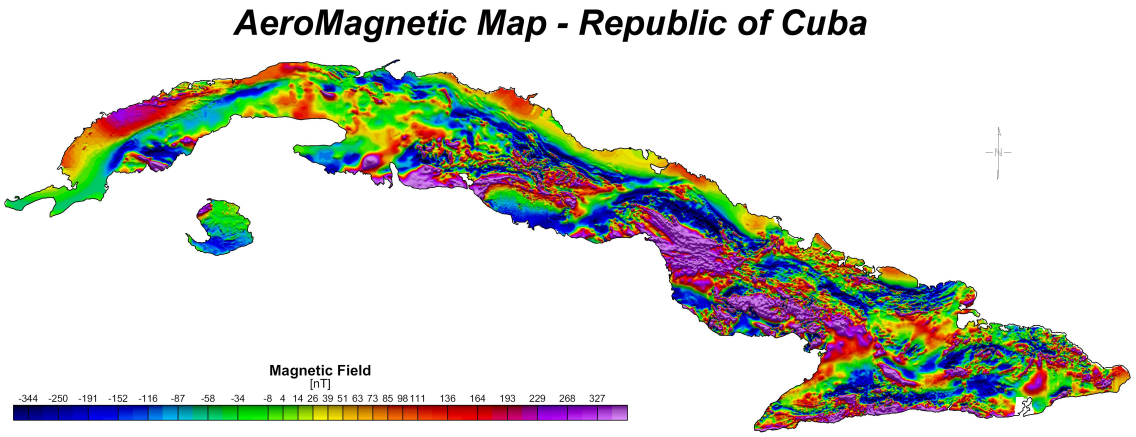

Figure 1 - First digital version of the Aero-Magnetic Map of Cuba

Map interpretation

A magnetic anomaly map represents a guide for delineating lithological units and structures. Areas in magenta and red (warmer color), exposing high magnetic content, are dominated by magnetic materials, coinciding with areas of volcanic arcs and rocks of mafic character.

Metamorphic rocks will be distinguished by yellow-green color, highlighting a long fault associated to serpentine that extends from east to west through the north along almost the entire country in NW-SE direction, hosting various lateritic deposits. Other faults also visible in the map are the Pinar fault (to the west), La Trocha fault (in the center) and Nipe fault (to the east) trending in NE-SW direction.

Areas in blue (cold color) are associated to sediments which contain minimal to non-magnetic materials, highlighting the intrusive granites south of the fault. It is attributed

to the possible presence of remanent magnetization where magnetic anomalies are observed with low signature. The Jurassic is the oldest geological period of formation reported in Cuba (Iturralde, 1994). Remanent magnetization is common in youngest rocks.

Recommendations

Due to the geographical location, the country exhibits magnetic inclination vector around 50°. For better interpretation, it is recommended to apply the reduction-to-pole (RTP) correction where the peak of a magnetic anomaly is positioned above the source. Calculating magnetic derivatives from the RTP product is also recommended to maximize data interpretation.

Conclusions

The map represents a valuable tool for exploration companies evaluating prospective areas and planning for detail target-oriented projects.

The map is updated regularly by the institute of Geology and Paleontology of Cuba as new magnetic survey results become available.

The Aero-Magnetic Map of the Republic of Cuba represents a relevant layer of the country's integrated datasets.

Acknowledges
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