Acquisition and processing of gravity data for the Metal Earth project

A Maleki[1], R Smith[1], E Eshaghi[1], P Altwegg[2]

[1]Harquail School of Earth Science, Mineral Exploration Research Centre, Laurentian University, Sudbury, Ontario; [2]MIRARCO - Mining Innovation, Laurentian University, Sudbury, Ontario;

The Metal Earth project aims to understand the underlying geological mechanisms that differentiates highly mineralized zones from poorly mineralized ones in Precambrian Rocks in the Canadian Shield. Geophysical prospecting methods such as reflection seismology, magnetotellurics (MT), and gravity, as well as geological observations, have been or will be acquired along selected transects perpendicular to the geological strikes in the Abitibi and Wabigoon greenstone belts. So far, we have contributed to the Metal Earth by collecting and processing gravity data across the Rouyn-Noranda, Amos-Malartic and Chibougamau transects. The geophysical crews acquired a total number of 1066 gravity observations during the first field season of the project. The average spacing between observations is 300m, and the stations were chosen alongside roads or within walking distance of roads. However, where the acquired data values look angular on plotted profiles, with sharp changes, infill data with 150 m spacing from adjacent stations were selected and data was acquired. All gravity readings were taken using two geophysics crews equipped with two Scintrex CG-6 gravity meter instruments. Seven new base stations (control points) were established at strategic locations, and the control point values were refined by tying them to existed base stations at the first day of data collection for each area. During the field period, readings were taken at control points at the start and end of each day. Each of these readings was taken over a 60 second measurement period, and the readings were repeated at least five times for every occupation. At all other stations, gravity was measured for 30 seconds and these readings were also repeated at least five times for each station and the average measured values was recorded for the stations. Global Navigation Satellite System (GNSS) data including Global Positioning System (GPS) and Global Navigation Satellite System (GLONASS) were acquired using a Juniper Systems Geode handheld device. The positional data from the differential GPS processing was then associated with each gravity reading. Therefore, each record consisted of station number, easting, northing, height and difference from the gravity at the base station. In order to compare two CG-6 measurements with each other, ten percent of the total number of daily measurements by both devices were designed to be measured by both devices. The Bouguer anomalies were then calculated to compile an initial database. We have also calculated terrain corrections and used them to calculate the complete Bouguer anomaly that will be used with magnetic data for subsurface modelling.