Aeromagnetic Survey Data Acquired near Yucca Mountain During 2004

Allen H. Cogbill
Geophysics Group
Los Alamos National Laboratory
Los Alamos, NM 87545

October 5, 2004

General Description

The data channels described below were acquired as part of a helicopter-borne, aeromagnetic and electromagnetic induction survey conducted under contract to Bechtel-SAIC, Inc. The primary subcontractor was Geophex, Ltd., of Raleigh, North Carolina. The electromagnetic data channels are not included here; only the total-field magnetic data are included and described.

All data were acquired begining February 19, 2004 and ending June 7, 2004; however, no data were acquired between February 22, 2004 and May 5, 2004. Except for two days, data acquisition from May 5, 2004 to June 7, 2004 occurred daily. All data were measured within the instrument housing (the "bird"), which was towed approximately 30 m below the helicopter. The helicopter nominally flew 60 m above the terrain, as the intended terrain clearance for the sensor package was 30 m. The primary flight lines were flown in an east-west direction, with a nominal flight-line spacing of 60 m. Secondary flight lines (tie lines) were flown in a north-south direction at a flight-line spacing of 600 m.

Total-field magnetic data were acquired using a Geometrics Model 823A cesium-vapor magnetometer; its manufacturer-specified accuracy at the sample rate used (10 Hz) is ± 0.01 nT (90% confidence level). The location of all measurements was determined using a differentially-corrected GPS system, with a manufacturer-specified horizontal accuracy of ± 1 m (the vertical accuracy is approximately half the horizontal accuracy, or ± 2 m). All total-field magnetic measurements are corrected for normal time variations in the earth's magnetic field using a recording base station magnetometer located at a fixed position in the survey area. The base station magnetometer was a Geometrics cesium-vapor magnetometer similar to the helicopter-towed instrument.

All GPS locations are the location of the GPS antenna located in the bird housing the magnetometer. The position of the magnetic field sensor was forward of the GPS antenna by 2.44 meters.

Data Files

The total magnetic field data are provided in two files. The primary data file contains data from the east-west flight lines, the so-called traverse lines. The secondary data file contains data from the north-south flight lines (the tie lines). Some of the data channels in these files are slightly different, and thus a separate description of each data file is provided. Note that the two data files

are provided as compressed zip archives; the files in the archives are plain-text files using ASCII characters and Unix end-of-lines.

The data in each file is organized into **lines**, each line containing the data acquired along either an east-west or a north-south line. Comments are occasionally provided in the file when either the **date** or the **flight number** changes; all lines containing comments begin with a double slash (that is, //). Immediately preceding the data for a particular flight line is a line containing the text **Line nn** (for the east-west line data) or **Tie nn** (for the north-south line data). Here, **nn** simply represents the line number assigned to that flight line.

Channel Description for Primary Data

The data for the primary east-west flight-line data can be found at the URL below:

ftp://ees.lanl.gov/pub/ahc/YMP/Aeromag/FinalMagData-TraverseLines.zip

The table below provides a description of the data in each field of the data file. Note that fields in the file are comma-separated. There are 3,922,528 lines in the data file.

Description of Data Fields for East-West Flight Lines

Field	Description
1	Longitude, in decimal degrees (datum: WGS'84)
2	Latitude, in decimal degrees (datum: WGS'84)
3	UTM Easting, Zone 11, in meters (datum: WGS'84; units: meters)
4	UTM Northing, Zone 11, in meters (datum: WGS'84; units: meters)
5	GPS elevation (ellipsoidal height, WGS'84; units: meters)
6	Radar altimeter (height of helicopter above ground; units: feet)
7	Date (YYYY/MM/DD)
8	GPS time of day (HH:MM:SS.sss)
9	Total magnetic field at the base station location, in nT. These values have been interpolated from the base station values, which were sampled once per second.
10	Measured total magnetic field, in nT
11	Measured total magnetic field (channel 10), in nT, corrected for time variations (measured the by base station magnetometer), for a heading error of 3 nT, and "leveled" using data from the tie-lines. The base station correction was made by simply subtracting the base station value from the measured magnetic field, then adding 50140 nT, the mean value of the field at the location of the base station.
12	Corrected total magnetic field (channel 11), corrected for spatial variation in the earth's main field, using the International Geomagnetic Reference Field (IGRF), as calculated for epoch of 15 May 2004.

Channel Description for Secondary Data

The data for the secondary north-south flight-line data can be found at the URL below:

ftp://ees.lanl.gov/pub/ahc/YMP/Aeromag/FinalMagData-TieLines.zip

The table below provides a description of the data in each field of the data file. Note that fields in the file are comma-separated. There are 394,208 lines in the data file.

Description of Data Fields for North-South Flight Lines

Field	Description
1	Longitude, in decimal degrees (datum: WGS'84)
2	Latitude, in decimal degrees (datum: WGS'84)
3	UTM Easting, Zone 11, in meters (datum: WGS'84; units: meters)
4	UTM Northing, Zone 11, in meters (datum: WGS'84; units: meters)
5	GPS elevation (ellipsoidal height, WGS'84; units: meters)
6	Radar altimeter (height of helicopter above ground; units: feet)
7	Date (YYYY/MM/DD)
8	GPS time of day (HH:MM:SS.sss)
9	Total magnetic field at the base station location, in nT. These values have been interpolated from the base station values, which were sampled once per second.
10	Measured total magnetic field, in nT
11	Measured total magnetic field (channel 10), in nT, corrected for time variations (measured the by base station magnetometer). The base station correction was made by simply subtracting the base station value from the measured magnetic field, then adding 50140 nT, the mean value of the field at the location of the base station.
12	Corrected total magnetic field (channel 11), corrected for spatial variation in the earth's main field, using the International Geomagnetic Reference Field (IGRF), as calculated for epoch of 15 May 2004.