GM 58115

HIGH SENSITIVITY AEROMAGNETIC, GRADIOMETRIC AND VLF SURVEY, TORNGAT MOUNTAINS, SURVEY REPORT, PROJECT REF. 99A08-20

TWIN GOLD CORPORATION

HIGH SENSITIVITY AEROMAGNETIC, GRADIOMETRIC AND VLF SURVEY

Torngat Mountains, Ungava Bay

NTS Maps: 24P/06-07-10-11

SURVEY REPORT

Project Ref. 99A08-20

By

SIAL GEOSCIENCES INC.

March 2000

SIAL

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1.0 INTRODUCTION

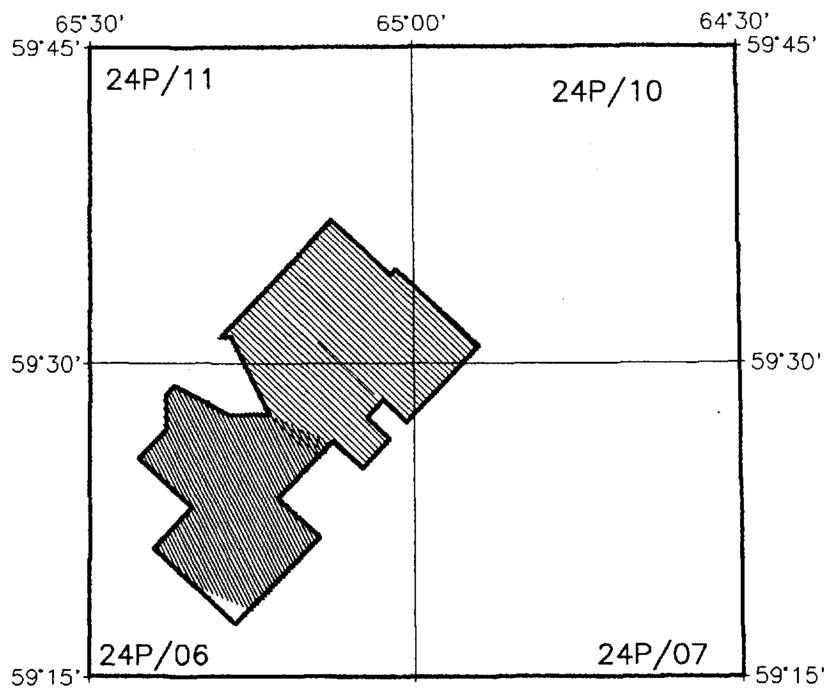
This report describes the data acquisition and processing of a high sensitivity aeromagnetic, gradiometric and VLF airborne survey carried out for **TWIN GOLD CORPORATION** by **SIAL Géosciences Inc.**

The survey area consisted of one block located in the Torngat Mountains, Ungava Bay. This location, at 59° North latitude, is within the Nunavik territory of Northern Québec. The base of operations was installed at Kangiqsualujjuaq (George River).

Survey flying commenced December 20, 1999 and was completed January 24, 2000. Preliminary maps were delivered to **TWIN GOLD CORPORATION** on February 15, 2000. Final processed data on CD-ROM were delivered on March 2000.

A total of 5 000 line-km of airborne survey was flown on traverse lines oriented 315° (in the northern part of the survey area) and 295° (in the southern part of the survey area) at nominal line spacing of 100 metres and aircraft ground clearance of 90 metres. The spacing between traverse lines never exceeded 1.5 times the nominal line spacing at any point, or 1.25 times the ideal spacing over a distance of 2 km. Tie-lines, 1 000 metres spaced, were flown in a direction perpendicular to traverse lines.

The purpose of the survey was to map elongated or round-shaped magnetic anomalies that could be related to kimberlite intrusive bodies



TWIN GOLD CORPORATION

TORNGAT BLOCK

Figure 1 : SURVEY AREA

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2.0 SCHEDULE

Mobilisation of the personnel and equipment was done from LG-2 to Kangiqsualujjuaq on December 7, 1999. Survey started on December 20, 1999, and ended January 24, 2000. Demobilisation from Kangiqsualujjuaq to Montreal was done on January 25, 2000. No field works were done between December 22, 1999, and January 6, 2000.

3.0 PERSONNEL

The survey crew consisted of:

Olivier Ayotte: An experienced operator/electronic technician, who operated the geophysical instruments, assisted with aircraft navigation and compiled and checked the data with the in-field workstation.

Eric Picaud: A professional pilot who flew the geophysical instrumentation safely and within survey specifications.

Final data evaluation and processing was carried out at **SIAL**'s office in Montreal by experienced **SIAL**'s data processors.

4.0 EQUIPMENT USED

4.1 Aircraft

The survey aircraft was a Piper Navajo PA31-310, registration C-GAKM. The aircraft was equipped with a magnetometer stinger and a VLF electromagnetic receiver.

Aircraft survey-speed was approximately 240 km/h. At this speed, the distance between samples along survey lines was typically 6 metres for the magnetic field data, and 30 metres for the VLF-EM data.

4.2 Magnetometers

4.2.1 Airborne magnetometer-gradiometer

The airborne magnetometer-gradiometer system consisted of two Geometrics G822A cesium-vapour, split-beam, total field sensors mounted at the aft of a non-magnetic tail-stinger gradiometer. The vertical separation between sensors was 2.18 metres. Sensors specifications were:

Sensor static resolution:	better than 0.1 nT
In-flight sensitivity:	±0.001 nT
Resolution:	±0.005 nT
Absolute accuracy:	±10 nT
Dynamic range:	20 000 - 100 000 nT
In-flight noise envelope:	< 0.5 nT
Sampling rate:	ten readings per second or approximately 7 metres
Heading error:	< 0.25 nT
Gradient tolerance:	10 000 nT/m

4.2.2 Compensator

The aircraft generated magnetic field was compensated with an Automatic Aeromagnetic Digital Compensator unit (AADCII) yielding digital signal correction of 18 to 30 terms based on the vector field components and their derivatives as measured by a 3-axis fluxgate sensor.

4.2.3 Ground magnetometer

A GEM GSM-19 overhausser base station magnetometer located at the base camp was used to monitor the fluctuations in the earth's magnetic field. The earth's magnetic field was measured every 3 seconds to record the diurnal activity. The base station was located in an area of low magnetic gradient and free of cultural interference.

Data were recovered daily and the diurnal corrections computed and applied to the survey data in order to produce preliminary maps for quality control. The airborne magnetometer and the base station were synchronised with accuracy better than 1.0 second. The technical specifications of the base station are:

Base station magnetometer:	GEM GSM-19 overhausser
Sensor static resolution:	better than 0.1 nT
Sensitivity:	±0.001 nT
Dynamic range:	20,000 - 95,000 nT
Noise envelope:	less than 0.1 nT
Recording interval:	3 seconds

4.3 VLF Electromagnetic System

The VLF-EM system uses 3 orthogonal coils to measure the total field and quadrature component of the VLF field. The NAA (frequency: 24 kHz) VLF-station-transmitter located at Cuttler, Maine, was selected. System specifications are:

Manufacturer:	HERTZ
Model:	Totem 2A
Accuracy:	1%
Sampling interval:	0.5 second

The VLF sensor was located in a stinger fixed to the aircraft nose. The availability & signal quality of the VLF stations were accepted as encountered during the survey flights and were not a factor in limiting flying.

4.4 Positioning System

4.4.1 GPS Receiver

In flight positioning was sampled at a rate of 1 hertz using a TRIMBLE-4000SE real-time differential GPS receiver system, in conjunction with a Land-Star satellite-link and a PICODAS PNAV-4001 navigation console. The system enables data to be positioned to an absolute accuracy better than 5 metres. At least, 4 satellites were monitored at all times during the survey.

4.4.2 Altimeters

Terrain clearance was sampled each 0.2 second, using a KING KRA-10 radar altimeter. The radar altimeter recorded the ground clearance to an accuracy of 1 metre. Recordings were in both digital and analog form.

4.4.3 Video Camera

A vertically mounted continuous recording ELMO TSN272 colour video camera with a wide-angle lens recorded at all times the flight path terrain beneath the aircraft. The video camera recorded, in the top portion of each frame, the flight line number, fiducial, time and GPS generated X-Y UTM co-ordinates.

4.5 Acquisition System

A RMS DGR-33 data logging system and an on-board HDS60 graphical display data-acquisition system were used. These systems:

- Accepted digital data from the magnetometer, VLF receiver, radar altimeter, time and raw GPS positions

- Produced a hard-copy graphic record (analog) of both coarse and fine scales data from the magnetometer, VLF receiver, radar and barometric altimeters data, fiducial date and time

- Produced a digital machine-readable record of raw data on an external tape-drive

The analog records were of sufficient resolution to enable visual checks to be made of system performance. Two-second intervals were indicated on the analog by means of short tics and fiducial numbers printed at 10-seconds intervals.

The data acquisition system was synchronised to GPS time through a one-second GPS pulse. Synchronisation was checked at the end of each day of survey.

5.0 DATA PROCESSING

5.1 Flight path

Flight path was recovered from the differential GPS X and Y data. It was verified daily to enable reflights to be called where needed.

5.2 Magnetic data processing

The aeromagnetic data was quality controlled using the fourth difference, as well as the difference (gradient) between the two sensors, and edited as necessary. The base station magnetometer variations, lag and heading errors were removed from the entire data set. The resulting data were further levelled using tie lines and gridded **without any filtering** using the Random gridding algorithm supplied in the GEOSOFT software. The grid-cell size was 25 metres (1/4 of the line spacing). The International

Geomagnetic Reference Field was not removed from the total magnetic field but a reduction-to-the-pole filter was applied on the data and maps plotted.

No special processing were applied to the vertical gradient data.

5.3 VLF-EM data processing

In-phase and total field VLF data were filtered using a Triangular filter (length of 61 points, or 6 seconds) to reduce high frequency noise and background shifts. On Monday, January 10, the NAA VLF station was close and only electromagnetic noises were registered (Flight 5, flight lines 17301 to 21301)

6.0 SURVEY PRODUCTS

6.1 Maps

Each final map displays a geophysical parameter, the flight path, topographic features and UTM registration (NAD 27). Three black and white and three colour paper-prints of the following final contour maps, at a scale of 1:20 000, were delivered to **TWIN GOLD CORPORATION** at the end of March, 2000:

- Total-Magnetic-Field
- Reduction to pole
- Measured Vertical-Magnetic-Gradient
- Digital topographic elevations
- VLF-EM Total Field Profiles (black & white only)

Two copies of the same maps, at a scale of 1:50 000, were also delivered along with Calculated Second Derivative of the Total Magnetic Field and the VLF-EM Total Field contours.

6.2 Digital Data

Two copies of a CD-ROM containing the digital data archives of XYZ line data and grids in ASCII format compatible with GEOSOFT data processing software were delivered (see appendix A). The archived information contain raw and processed information separated on a line basis, including the magnetic base station channel and all channels required to produce the final map products.

All digital data were georeferenced to the standard UTM-system for the area (NAD27).

6.3 Other Products

Three paper-copies of an INTERPRETATION MAP at a scale of 1:50 000 with three copies of this report have been finally produced and delivered to **TWIN GOLD CORPORATION**, accompanied with videotapes, analogs, and all information recorded during the course of the survey.

7.0 GEOLOGY

7.1 Kimberlites and Diamonds in Northern Quebec[1]

Four kimberlite fields are located in Quebec: Temiscamingue, Desmaraisville, Otish and Torngat fields.

The Temiscamingue field is located in the Pontiac and Abitibi Sub-Provinces near the Quebec/Ontario border. The portion of the field located in Quebec contains 3 weakly diamondiferous diatreme and hypabyssal facies kimberlite pipes.

The Desmaraisville field is located in the north-central portion of the Abitibi Sub-Province. It contains 5 weakly diamondiferous hypabyssal facies kimberlite pipes and numerous dykes.

The Otish field is located in the NE portion of the Opatica Sub-Province near the northern margin of the early Proterozoic Otish basin. It contains one weakly diamondiferous hypabyssal facies pipe and an adjacent dyke swarn.

Diamondiferous kimberlite dykes have recently been identified in the Abloviak Fjord area of the Torngat Mountains, to the West of the Nain craton. During the fall of 1999, **TWIN GOLD CORPORATION** recovered more than 250 diamonds from 3 kimberlite dykes. The northern portion of the Superior Province in Quebec represents an attractive area for diamond exploration. Noteworthy features would include the presence of large-scale brittle fault zones, locally hosting alkaline intrusions, and the NE projection of the Kapuskasing structural zone into northern Quebec. This

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[1] From Moorhead, J, Perreault, S, Berclaz, A, Sharma, K N M, Beaumier, M, Cadieux, A-M, 2000; Kimberlites and Diamonds in Northern Quebec. Ministère des Ressources Naturelles du Québec, 10 p., PRO 2000-05

projection corresponds to a zone where orientations of the main lineaments change from a WSW direction, in the central part of the craton (i.e. the Saindon-Cambrian Zone), to a NW direction on its western margin (i.e. the Richmond Gulf Zone). It also encompasses a kimberlite indicator dispersion train near the village of Wemindji, on the eastern shore of James Bay, and a recently discovered alkaline dyke field further to the NE, adjacent to the Labrador Trough. Curiously, the NE projection of the Kapuskasing tectonic zone also intersects the diamondiferous kimberlite dykes located in Abloviak Fjord, adjacent to the Torngat Mountains.

7.2 Regional Geology[2]

The surveyed block lies within the geologic Torngat Mountains Province and covers a complex geological environment. The predominant rock type is the Tasiuyak Gneiss, a Northwest trending belt of gneisses extending southwards into Labrador.

Within the property, the rocks of the Torngat Mountain Province strike Northwest-Southeast. Cross-cutting the gneisses, there are a number of kimberlite dykes. The first dykes discovered are located on the northern shore of the Alluviaq Fjord. These dykes strike Northeast and are nearly vertical. They are exposed on the steep side of the fjord, typically in crevices where the kimberlite has been eroded preferentially and the debris from weathering flushed from the crevice by water flowing over the fjord wall. **TWIN GOLD CORPORATION** sampled three dykes in this area. The largest, Torngat 1, has been traced for about 1.5 km across the plateau.

Near the Baufremont River, in an area named by **TWIN GOLD CORPORATION** "Torngat South", other kimberlite dykes were discovered. A small sample of fine-grained float (AD 10), overlying a dyke estimated to be about 3 metres wide confirmed the presence of diamonds.

[2] From **TWIN GOLD CORPORATION** annual report, 1999

8.0 RESULTS AND CONCLUSION

Brief comments on the geophysical results are offered below. With the aim of compiling all the relevant data arising from the interpretation of the geophysical survey, and comparing these data to the available geological information, an INTERPRETATION MAP has been produced at a scale of 1:50 000. In the following sections, to fully understand the text, the reader is asked to refer to this map.

8.1 Magnetic Results

Magnetic anomalies can be produced by a number of causative features such as lithology changes, variations in the thickness of magnetic units, faulting, folding, and topographic relief. A significant amount of information can be obtained from a qualitative review of the total-field magnetic, gradiometric and second derivative maps. At its simplest, the aeromagnetic/gradiometric/second derivative maps, when interpreted, gives information comparable to that provided by a geologist. The maps show magnetic and non-magnetic units, folds and faults that affect certain igneous, sedimentary or metamorphic rocks and intrusions. The value of the survey does not end with the first interpretation, but rather increases as more is discovered about the geology.

The maximum variation of the magnetic field seen on the total field magnetic maps over the survey area is 1 396 nT, ranging from 56 802 nT to 58 198 nT.

Based on the characteristic patterns of the magnetic total field, gradiometric and second derivative, an inspection of the maps suggests the following points:

- The dominant orientations of the magnetic trends are northwest to north-northwest
- Strong magnetic highs are observed in the southwestern and north-

western parts of the block
- The measured vertical gradient and the calculated second derivative provide superior resolution of numerous sources, many of which appear to be mafic dykes
- Many dykes are recognisable by their distinct elongated pattern in the central part of the survey area
- Many small round-shaped magnetic highs are sparsely distributed over the northern part of the block
- Numerous faults have been mapped in the southern part of the survey area.

8.2 VLF Results

The plotted VLF-EM Total field profiles show that a number of weak to moderate conductors can be recognised, principally correlating with lakes, rivers and topographic relief. Some of these conductors superimpose exactly with faults already mapped with the magnetic survey.

Camille St-Hilaire, M.Sc.A.
Geophysicist

APPENDIX A

CONTENTS OF CD-ROMS

SIAL

CD-ROM ARCHIVED DATA

SIAL GEOSCIENCES INC. March 22nd, 2000

Data Files

-Format: Geosoft XYZ format
-Sampling: 0.1 second (magnetic)
0.5 second (EM-VLF)
-Units: positioning: meters
Magnetic: nT.
EM-VLF: %
-Lines: LINE: traverse lines
TIE: control lines
-dummies: non-values are represented by an asterisk (*), according to Geosoft format. They will usually be found at the beginning and end of each flight lines, due to different original sampling rates and to the effect of lag correction on magnetic data.
-files: tgn.xyz (north zone)
tgc.xyz (center zone)
tgs.xyz (south zone)
tg.xyz (without partition)
interpretation file: int.grd

Channel	**Name**	**Definition**	**Comments**
1	X	UTM E	Corrected for GPS jumps
2	Y	UTM N	(<25m)
3	XROT	UTM E	Rotation of 45 degrees
4	YROT	UTM N	Rotation of 45 degrees
5	LAT	Degrees	Ellipsoide WGS 1984
6	LON	Degrees	Projection UTM
7	FIDUCIAL	Fiducial	(seconds)
8	VOL	flight #	
9	TIMERMS	time	
10	ZGPS	GPS altitude	Corrected for GPS jumps
11	BARO	Barometer (volt)	Original barometer
12	BAROMC	Barometer (m)	Corrected barometer
13	RADAR	Radar (m)	Corrected for radar
14	RADARL	Radar (m)	Lagged radar
15	TOPO	Topography (m)	Zgps-radar
16	TOPOL	(m)	Zgps-radarl
17	TOPOLVL	(m)	Levelled topo
18	TOPOLVLD	(m)	Micro-levelled topo

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19	BASE	mag station (nT)	Corrected for spike
20	BASEF	Mag station (nT)	Filtered mag station
21	Cordiur	Diurnal mag drift	Basemag - average
22	MIGRF	Regional IGRF	
23	MAG1B	Diurnally corrected	CMAG1 channel
24	MAG1BL	Diurnally corrected and lagged	CMAG1 channel
25	MAG2O	Raw MAG2 data (higher mag.)	
26	MAG2	Corrected MAG2O	Channel for de-spiking
27	MAG2B	Diurnally corrected	CMAG2 channel
28	MAG2BL	Diurnally corrected and lagged	CMAG2 channel
29	MAG1H	Heading corrected	MAG1BL channel
30	MAG2H	Heading corrected	MAG2BL channel
31	MAGLVLO	Diurnally corrected, lagged, headed, and tie-line levelled MAG2 channel	
32	MAGLVL	MAGLVLO with segments where closely flown lines have one line segment of mag removed	
33	COR?LVL0	Levelling correction factor (MAG2LVL=MAG2H+CORM2LVL0) (corm1lvl0, corm2lvl0, cortlvl0, corglvl0 for levelling correction on mag1, mag2, topo and measured gradient respectively)	
34	COR?LVL1	Decorrugation factor for micro-levelling (MAGLVLD= MAGLVL +CORLVL1) (corm1lvl1, corm2lvl1, cortlvl1, corglvl1 for micro-levelling correction on mag1, mag2, topo and measured gradient respectively)	
35	MAG?LVLD	MAGLVL with micro-levelling applied (final magchannel)(mag1lvld, mag2lvld) (mag2h+cordiur+corlvl0+corlvl1=mag2lvld)	
36	RES	Residual of the total magnetic field mag2lvld (mag2lvld-migrf=res)	
37	REDPOL	sampled channel from the reduction to the pole grid	
38	GRAD_MES	measured gradient from the gradiometer ((mag1bl-mag2bl)/2.1)	
39	GRADLVL	levelled measured gradient	
40	GRADLVLD	microlevelled measured gradient	
41	VLF1	Raw vlf data received from U.S. Military Cutler, Maine 24000HZ transmitter station	
42	VLF1L	Lagged VLF1 channel	
43	VLFIF	Filtered VLF1L channel (25 fiducial Hi-Pass filter followed by a 5 fiducial Low-Pass filter)	
44	VLFERRF	Filtered VLFERR channel (7 fiducial Low-Pass filter) from the decorrugation grid sampled in the database	
45	VLFD	Decorrugated VLF1F channel (VLFD=VLF1F-VLFERRF)	
46	VLFDGRD	Database sampled VLFD channel grid	
47	CORVLF1	Correction channel (CORVLF1=VLF1F-VLFDGRD)	
48	VLFFIN	Final corrected VLF1 channel (VLFFIN=VLF1F+CORVLF1)	

LAG

Magnetic

Flight 1,2,4,6,7,8,9:	1 second
Flight 3,5,10:	1.4 second

Radar

Flight 1,2,4,6,7,8,9:	2.1 second
Flight 3,5,10:	2.5 second

EM-VLF

Flight 1:	data not used
Flight 2:	0.3 s
Flight 3:	0 s
Flight 4:	0 s
Flight 6:	-5.0 s
Flight 7:	-0.3 s
Flight 8:	-7.8 s
Flight 9:	-0.3 s
Flight 10:	0 s
Flight 5:	data not used

ROTATION OF THE COORDINATES (from nad83 to nad27)

Angle:	-45 degrees
Reference:	361820, 6575620

GRID FILES AND CONTOUR FILES (without vlf files)

- for 20 000 maps (grid) (.grd and .zon)
  - g(n,c,s)_c, g(n,c,s)_cr : measured gradient without, with rotation
  - m1(n,c,s)_c, m1(n,c,s)_cr : mag1 without, with rotation
  - m2(n,c,s)_c, m2(n,c,s)_cr : mag2 without, with rotation
  - t(n,c,s)_c, t(n,c,s)_cr : topography without, with rotation
  - rp(n,c,s)_c, rp(n,c,s)_cr : reduction pole without, with rotation

- for 20 000 maps (contour)
  - ngdt(n,c,s)20.plt and .att: measured gradient with rotation
  - nm2t(n,c,s)20.plt and .att: mag2 with rotation
  - ntpt(n,c,s)20.plt and .att: topography with rotation
  - nrpt(n,c,s)20.plt and .att: reduction pole with rotation

- for 50 000 maps (grid) (.grd and .zon)
  - grad_c, grad_cr : measured gradient without, with rotation
  - mag1_c, mag1_cr : mag1 without, with rotation
  - mag2_c, mag2_cr : mag2 without, with rotation
  - d2_c, d2_cr : calculated second derivative without, with rotation
  - topo_c, topo_cr : topography without, with rotation
  - rp_c, rp_cr : reduction pole without, with rotation

- for 50 000 maps (contour)
  - ngdt500.plt and .att: measured gradient without rotation
  - nm2t500.plt and .att: mag2 without rotation
  - ntpt500.plt and .att: topography without rotation
  - nrpt500.plt and .att: reduction pole without rotation

- for 50 000 maps (shadow grid) (.grd and .zon)
  - sg : measured gradient without rotation (i:45, D:320)
  - sm2: mag1 without rotation (i:45, D:320)
  - sd2: calculated second derivative without rotation (i:45, D:300)
  - srp: reduction pole without rotation (i:45, D:320)

```
Description File For Twingold

----------------------------------------------------------------------
--
SIAL GEOSCIENCES INC.                                 March 24nd, 2000
----------------------------------------------------------------------
--
FINAL levelled/adjusted total field data files.
----------------------------------------------------------------------
--
DELIVERED PRODUCTS

Data Files
----------

-format:    Geosoft XYZ format
-sampling:  0.1 second
-units:     positioning in meters, mag in nT.
-lines:     LINE: traverse lines
            TIE:  control lines
-dummies:   non-values are represented by an asterisk (*), according
            to Geosoft format.  They will usually be found at the
            beginning and end of each flight lines, due to different
            original sampling rates and to the effect of lag correctio
n
            on mag data.

-files:     tgn(1,2)xyz  (north zone)
            tgc(1,2).xyz (center zone)
            tgs(1,2).xyz (south zone)
            tg(1,2).xyz  (without partition)
            tg_vlfa.xyz  (only VLF data without partition)
            tg_vlfn.xyz  (north zone)
            tg_vlfc.xyz  (center zone)
            tg_vlfs.xyz  (south zone)

N.B. The files 1 and 2 contain different channels:
Channels 1 to 16 are in files 1
Channels 17 to 43 are in files 2
Channels 44 to 51 are in the vlf files

Interpretation file: int.grd

              name    definition               comments
              -------  -----------------------  ----------------------
---
-channels:  1 X        UTM E                     corrected for GPS jum
ps
```

```
  2 Y          UTM N                          (<25m)
  3 XROT       UTM E                          rotation of 45 degree
s
  4 YROT       UTM N
  5 LAT        degrees                        ellipsoide WGS 1984
  6 LON        degrees                        projection UTM
  7 FIDUCIAL   fiducial (seconds)
  8 TIMERMS    time
  9 BASE       mag station (nT)             corrected for spike
 10 BASEF      mag station (nT)             filtered mag station
 11 cordiur    diurnal mag drift            basemag - average
 12 COR?LVL0   Levelling correction factor
               (MAG2LVL=MAG2H+CORM2LVL0)
               (corm1lvl0, corm2lvl0, cortlvl0, corglvl0 for
               levelling correction on mag1, mag2, topo and
               measured gradient respectively)
 13 COR?LVL1   Decorrugation factor for micro-levelling
               (MAGLVLD=MAGLVL+CORLVL1)
               (corm1lvl1, corm2lvl1, cortlvl1, corglvl1 for
               micro-levelling correction on mag1, mag2, topo
               and measured gradient respectively)
 14 GRAD_MES   measured gradient from the gradiometer
               ((mag1bl-mag2bl)/2.1)
 15 GRADLVL    levelled measured gradient
 16 GRADLVLD   microlevelled measured gradient
 17 MAG1O      Raw MAG1 data (lower magnetometer)
 18 MAG1       Corrected MAG1O channel for despiking
 19 MAG1B      Diurnally corrected CMAG1 channel
 20 MAG1BL     Diurnally corrected and lagged CMAG1 channel
 21 MAG2O      Raw MAG2 data (higher magnetometer)
 22 MAG2       Corrected MAG2O channel for despiking
 23 MAG2B      Diurnally corrected CMAG2 channel
 24 MAG2BL     Diurnally corrected and lagged CMAG2 channel
 25 MAG1H      Heading corrected MAG1BL channel
 26 MAG2H      Heading corrected MAG2BL channel
 27 MAGLVLO    Diurnally corrected, lagged, headed, and tie-
               line levelled MAG2 channel
 28 MAGLVL     MAGLVLO with segments where closely flown line
s
               have one line segment of mag removed
 29 MAG?LVLD   MAGLVL with micro-levelling applied (final mag
               channel)(mag1lvld, mag2lvld)
               (mag2h+cordiur+corlvl0+corlvl1=mag2lvld)
 30 MIGRF      regional IGRF
 31 RES        Residual of the total magnetic field mag2lvld
               (mag2lvld-migrf=res)
 32 REDPOL     sampled channel from the reduction to the pole
               grid
```

```
33 RADAR      radar (m)                  corrected for radar
34 RADARL     radar (m)                  lagged radar
35 TOPO       topography (m)             zgps-radar
36 TOPOL      (m)                        zgps-radarl
37 TOPOLVL    (m)                        levelled topo
38 TOPOLVLD   (m)                        micro-levelled topo
39 ZGPS       GPS altitude               corrected for GPS jum
ps
40 i          magnetic inclination (degrees)
41 d          magnetic declination (degrees)
42 BARO       barometer (volt)           original barometer
43 BAROMC     barometer (m)              corrected barometer
44 VLF1       Raw vlf data received from U.S. Military
              Cutler, Maine 24000HZ transmitter station
45 VLF1L      Lagged VLF1 channel
46 VLFIF      Filtered VLF1L channel (25 fiducial Hi-Pass
              filter followed by a 5 fiducial Low-Pass
              filter)
47 VLFERRF    Filtered VLFERR channel (7 fiducial Low-Pass
              filter)from the decorrugation grid sampled in
              the database
48 VLFD       Decorrugated VLF1F channel (VLFD=VLF1F-VLFERRF
)
49 VLFDGRD    Database sampled VLFD channel grid
50 CORVLF1    Correction channel (CORVLF1=VLF1F-VLFDGRD)
51 VLFFIN     Final corrected VLF1 channel   (VLFFIN=VLF1F+C
ORVLF1)
```

LAG

```
        Mag
                Flight 1,2,4,6,7,8,9:     1 second
                Flight 3,5,10:          1.4 second
        Radar
                Flight 1,2,4,6,7,8,9:   2.1 second
                Flight 3,5,10:          2.5 second
        VLF     Flight 1: data not used
                Flight 2: 0.3 s
                Flight 3: 0 s
                Flight 4: 0 s
                Flight 6: -5.0 s
                Flight 7: -0.3 s
                Flight 8: -7.8 s
                Flight 9: -0.3 s
                Flight 10: 0 s
                Flight 5: data not used
```

ROTATION OF THE COORDINATES

```
(from nad83 to nad27)
    Angle:  -45 degrees
    Reference: 361820, 6575620


GRID FILES AND CONTOUR FILES


- for 20 000 maps  (grid) (.grd and .zon)
 g(n,c,s)_c, g(n,c,s)_cr   : measured gradient without, with rotation
 m1(n,c,s)_c, m1(n,c,s)_cr : mag1 without, with rotation
 m2(n,c,s)_c, m2(n,c,s)_cr : mag2 without, with rotation
 t(n,c,s)_c, t(n,c,s)_cr   : topography without, with rotation
 rp(n,c,s)_c, rp(n,c,s)_cr : reduction pole without, with rotation
 vlf(n,c,s)                : VLF with rotation

-  for 20 000 maps  (contour)
 ngdt(n,c,s)20.plt and .att:    measured gradient with rotation
 nm2t(n,c,s)20.plt and .att:    mag2 with rotation
 ntpt(n,c,s)20.plt and .att:    topography with rotation
 nrpt(n,c,s)20.plt and .att:    reduction pole with rotation

- for 50 000 maps  (grid)  (.grd and .zon)
 grad_c, grad_cr : measured gradient without, with rotation
 mag1_c, mag1_cr : mag1 without, with rotation
 mag2_c, mag2_cr : mag2 without, with rotation
 d2_c, d2_cr     : calculated second derivative without, with rotation
 topo_c, topo_cr : topography without, with rotation
 rp_c, rp_cr     : reduction pole without, with rotation
 vlf_fin         : total field VLF

-  for 50 000 maps  (contour)
 ngdt500.plt and .att:  measured gradient without rotation
 nm2t500.plt and .att:  mag2 without rotation
 ntpt500.plt and .att:  topography without rotation
 nrpt500.plt and .att:  reduction pole without rotation

- for 50 000 maps  (shadow grid)  (.grd and .zon)
 sg : measured gradient without rotation (i:45, D:320)
 sm2: mag1 without rotation (i:45, D:320)
 sd2: calculated second derivative without rotation (i:45, D:300)
 srp: reduction pole without rotation (i:45, D:320)
 st:  topography without rotation (i:45,D:320)


----------------------------------------------------------------------
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We hope that the delivered final data products will be to your satisfaction.

Marie-Josee Bertrand
Fadi Alfar

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