NUMERY DEEPS GRAVITY SURVEY

L1NDSAY JOHANNSEN

May 2003

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Contents Introduction

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Introduction

A detail GPS gravity survey designated as Numery Deeps Gravity Survey has been carried out in an area approximately 175 kilometres east of Alice Springs in Northern Territory as an extension of a previous survey conducted in July 2002. This survey was conducted over 2 days from 11 May 2003 to 12 May 2003 on behalf of Linzy Johannsen.

The originally proposed survey was for 130 stations in 13 south-north lines coincident with MGA94 and with variable line and station spacing. The proposed area of the survey was bounded by MGA94 Zone 53 coordinates 560000E 7393800 in the south-west and 566300E 7398500N in the north-east. Prior to the commencement of the survey an additional 38 station in 6 lines were added, extending the survey to 567500E 7398500N in the north-east. The survey was completed as proposed with 3 observations repeated for quality control purposes and a further 7 stations from the original survey also reobserved but since no effort was made to reoccupy the original positions, these have not been included as repeats.
The Bouguer anomaly processing has been performed using a country rock density of 2.67 g/cc. The data presented with this report includes both AMG66 and MGA94 coordinates. Figure 1

below shows the location of the survey area.

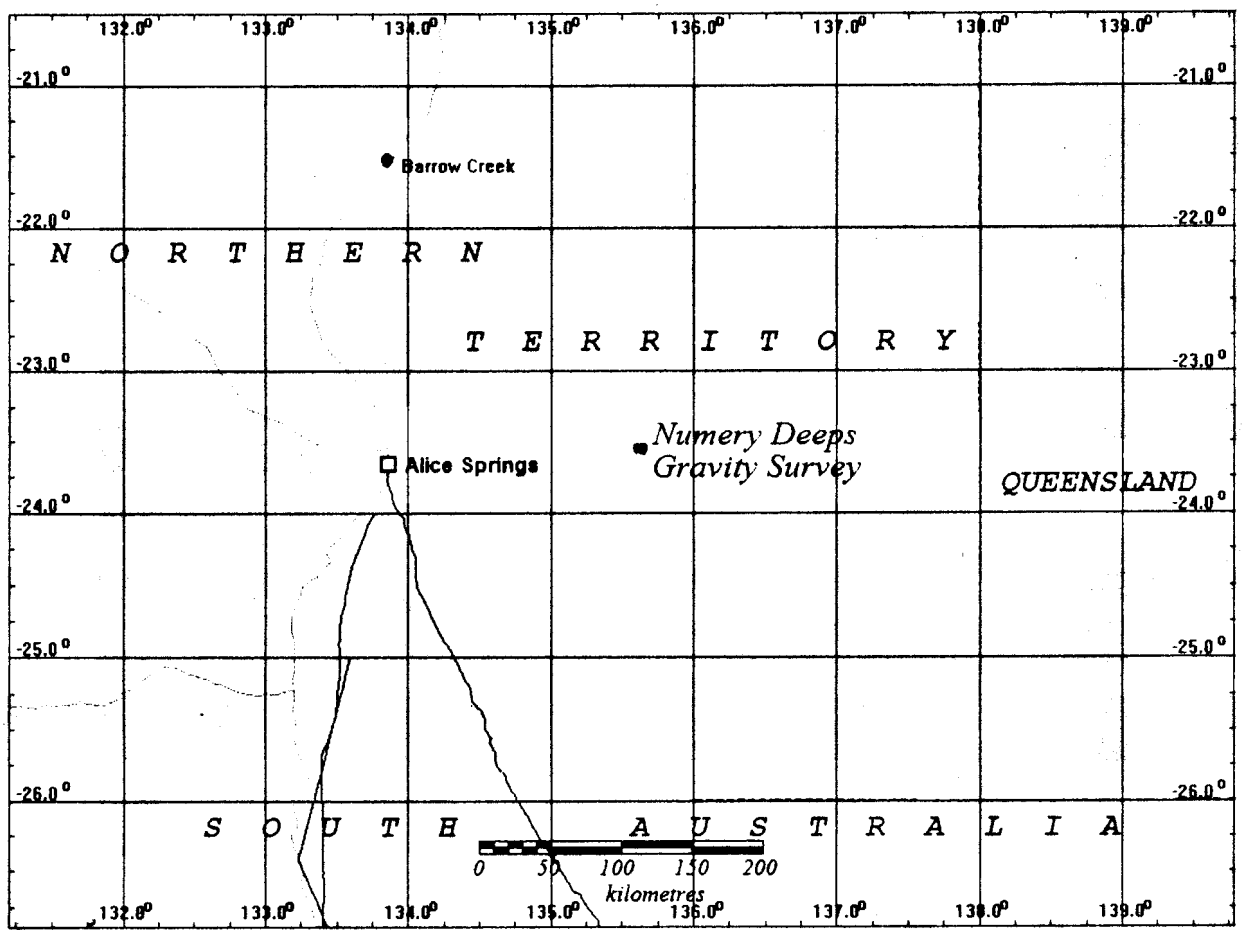


Figure 1. Location Diagram

GPS Observations and Processing

Carrier phase GPS data has been collected using *Trimble 4000* series Geodetic receivers. Measurements for detail gravity observations have been made using Real Time Kinematic (RTK) techniques giving horizontal and vertical precisions of at least 5 cm.
RTK processing has been completed using Trimble TDC1 firmware and TRIMMAP Version 6.50 software.
The GPS horizontal coordinates (WGS84 datum) have been adopted from the GDA94 values using a nul transformation process. The WGS84/GDA94 Latitude and Longitude have then been converted into MGA94 Zone 53 grid coordinates using TRIMMAP Version 6.50 software.

The GPS ellipsoidal heights (WGS84 datum) have been corrected to orthometric heights (AMD) using the AusGeoid98 geoid model for the control and the gravity stations.

Details of Horizontal and Vertical control are given in the sections below.

Gravity Observations

Gravity measurements have been made using *Scintrex CG3 Autograv* instruments. The instrument number 403244 was used in this project.

Readings of 120 seconds were taken at base station. Readings of 40 seconds were taken at all other gravity survey points.
Base station readings were taken at the beginning of the day and at the end of the day's fieldwork. The CG3 instrument applies an instrument drift correction to its final gravity reading. Any residual drifts between base station readings are corrected by the gravity post processing software. The instrument also applies Earth Tide Correction to its final gravity reading at each station. The instrument calibration constants are contained in the daily gravity data files.

Survey Control

No new local gravity/GPS base stations were established for this survey. See the report for the August 2002 survey for details of the fixing of HS000201,

Control information **(WGS84 heights have been derived using AusGeoid98):**

NUMERY DEEPS SURVEY / GRAVITY CONTROL

	GDA94/WGS 84			MGA94 Zone 53		AHD	lsogal84
Station	Latitude	Longitude	Height	Easting	Northing	Height	Gravity mgal
HS002010	-23° 33' 04.29228"	135° 37'29.43829"	376,195	563772.877	7395322.322	353,119	978758.455

Point Numbering and Marking

An 8 digit point number is used to identify each gravity station. The first 4 digits indicate the line number. The second 4 digits indicate the station number

The grid the lines are south-north and the 8 digits are constructed from the planned AMG coordinates for each gravity station using

Line No = (MGA E- 500000) /10 Stn No = (MGA N- 7300000 eg. Planned gravity station MGA94 coordinates
561000.000E 7394000.OOOE Line No = 6100
Station No = 9400 i.e.P1No= 61009400

Station numbers have not been expanded in the processed data. The gravity

stations have not been marked in the field.

Gravity Processing

The gravity values for this survey are related to the *Australian Gravity Base Station Network* using the *lsogal84 (IGSN 71)* values at known Gravity Stations as provided by *DMR.*

Note that all gravity values shown in these surveys are expressed in units of milligals.
The field gravity observations have been processed using standard formulae and constants to produce a Bouguer Anomaly for each gravity station.

The meter reading as recorded in the raw Scintrex data file is corrected for instrument tilts, meter drift and Earth Tide. Post processing corrections are detailed below.

Drift

The residual drift between base station readings is calculated for each station reading proportionately by time. This is the drift value shown in the processing output.

Drift = [(t^)((b;,-b^)/(t,-^))]

t = time of meter reading at each station
b = base meter reading prior to station reading
t = time of base reading b
b = base meter reading after station reading
t^ = time of base reading b^

Obs mgal

This is the observed gravity value in milligals.

Obs = b + (r - drift) - b,
g ' n -1

b = base stn gravity value (lsogal84) r^ = meter reading at each station as shown in the CG3 .dat file
drift = residual drift correction as shown above b^ = base meter reading prior to station reading

Anom

This is the difference between the observed gravity and the theoretical gravity value at each station. The theoretical value is calculated using the *1967 International Gravity Formula.*

Anom = Obs - g
'th

Obs = observed gravity as explained above

g^ = 978031.8 (1 + 0.0053024 $\sin^2$^ - 0.0((j> = WGS84 Latitude

g^ = 978031.8 (1 + 0.0053024 $\sin^2$^ - 0.0000059 sin^)

Freeair corrn

T

he freeair correction is calculated using Freeair

corrn = 0.3086 H

H = height above sea level (AHD height)

Bouguer corrn

Bouguer corrn = -0.04191 p H

p = density (2.67 g/cc used for this survey) H = height above sea level (AHD height)

Bouguer Anom Bouguer Anom = Anom + Freeair corrn + Bouguer corrn

Results Formats

Printed results of the gravity processing (with Bouguer corrections at density 2.67 g/cc) are included in the Appendix of this report. The results are also supplied in digital form on floppy disk with the following of files being supplied:

ALLCOR.XYZ ALLGEO.XYZ ALLCSV.CSV Field gravity observation files with the extension .DAT and .DC are also supplied in a separate subdirectory named OBS. -

ALLCOR.XYZ format

This is a *GEOSOFT* compatible XYZ (space delimited columns) file. The data is sorted by Day then Line and Stn number. The column order is as follows:

MGAE MGAN Line Stn drift corr'd obs anom freeair bouguer bouguer height meter mgal corrn corrn anom (AHD) (2.67)

ALLGEO.XYZ format

This is a *GEOSOFT* format XYZ (space delimited columns) file. The data is sorted into Line and Stn number suitable for profiling. The column order is as follows:

Line Stn MGAE MGAN drift corr'd obs anom freeair bouguer bouguer height meter mgal corrn corrn anom (AHD) (2.67)

ALLCSV.CSV Format

This is a Comma Separated Variable format file. This format facilitates data import into spreadsheet and database software. Each record (line) contains the following data fields:

Pt Number, Line No, Station No, Date, Day Number, Local Time, WGS Latitude, WGS Longitude, WGS Height, MGA East, MGA North, AHD Height, Meter reading, Meter reading standard deviation, Earth Tide Correction, drift correction, corrected meter reading, gravity difference (mgal) from base, observed gravity (mgals), gravity anomaly, freeair correction, Bouguer correction (2.67), Bouguer anomaly

*.DAT

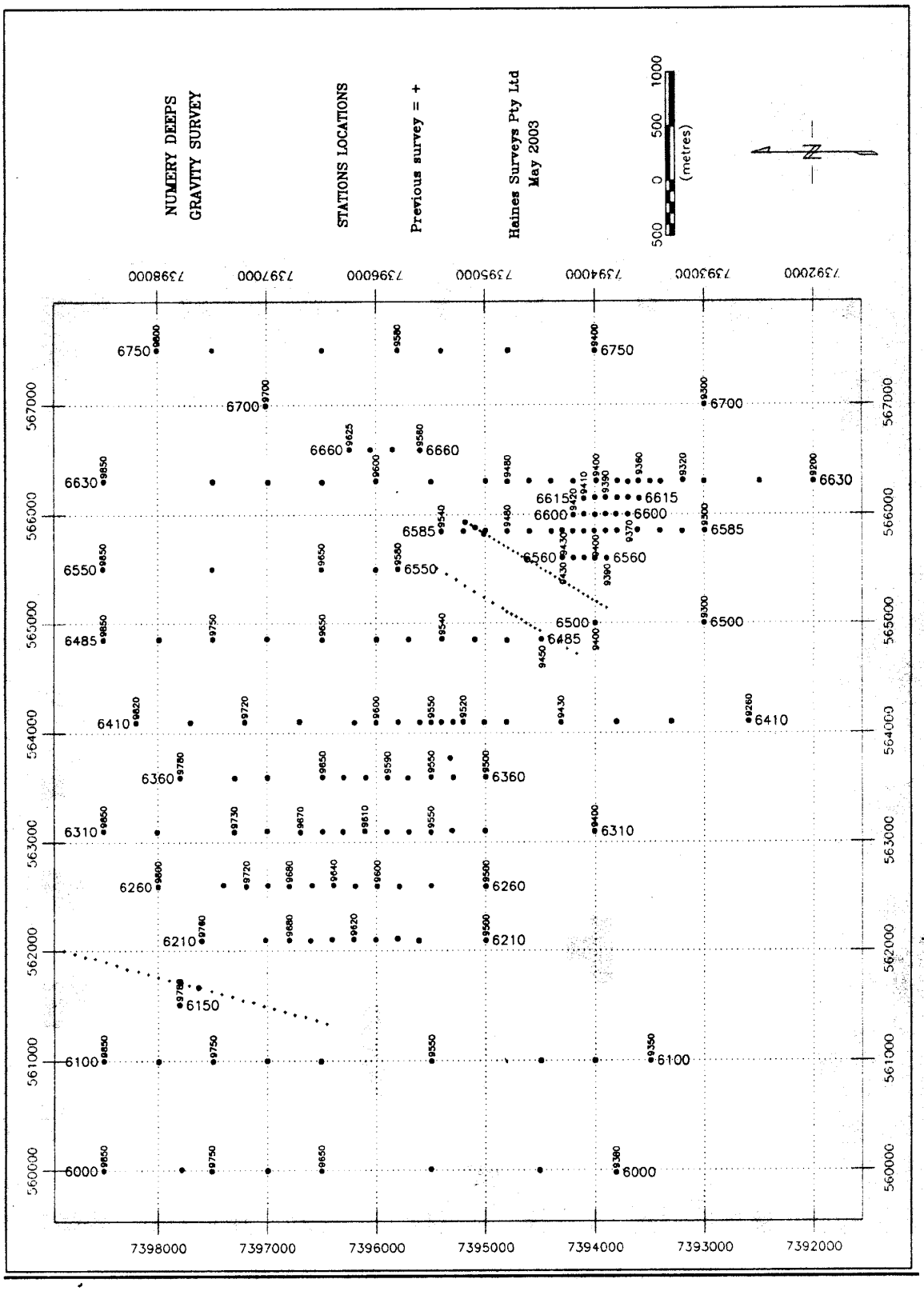
These are the raw data files from the *Scintrex CG3* gravimeter. There is a separate file for each day's data and for each field party. The files are identified by the Julian day number (001 = Jan 1st) with the prefix G. eg. G132 = day 132 (12th May).

*.DC

These are the GPS Real Time Kinematic Data Collector files. They are ASCII format files containing the GPS vectors from the base station. The data is structured in a Trimble format (DC file Version 4).

10000101	185	131	-5.554	-3.609	0.031	0.070	0.074	6.624	0.070	0.074
10000102	185	131	3.302	-10.127	-0.015	0.081	0.072	10.652	0.081	0.072
20000126	185	132	0.427	5.709	0.202	-0.054	-0.010	5.725	0.054	0.010
20000128	185	132	-2.532	-17.509	-0.906	0.207	0.018	17.691	0.207	0.018
64109550	131	132	-0.004	0.001	-0.010	-0.016	-0.018	0.004	0.016	0.018
64109560	131	132	-0.032	"0.001	0.000	-0.001	-0.001	0.032	0.001	0.001
66309350	131	132	0.044	-0.119	0.030	-0.053	-0.047	0.127	0.053	0.047

Mean	0.007	0.005	0.952	0.017	0.020
Min	-0.032	-0.033	0.196	0.002	0.001
Max	0.048	0.035	5.745	0.048	0.035
Count	11	11	11	11	11
SD	0.022	0.024	1.617	0.015	0.012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GRAVITY SURVEY
STATIONS LOCATIONS
Previous survey = +
Haines Surveys Pty Ltd
May 2003
500 0 500 1000
(metres)
7398000
7397000
7396000
7395000
7394000
7393000
7392000
567000
566000
565000
564000
563000
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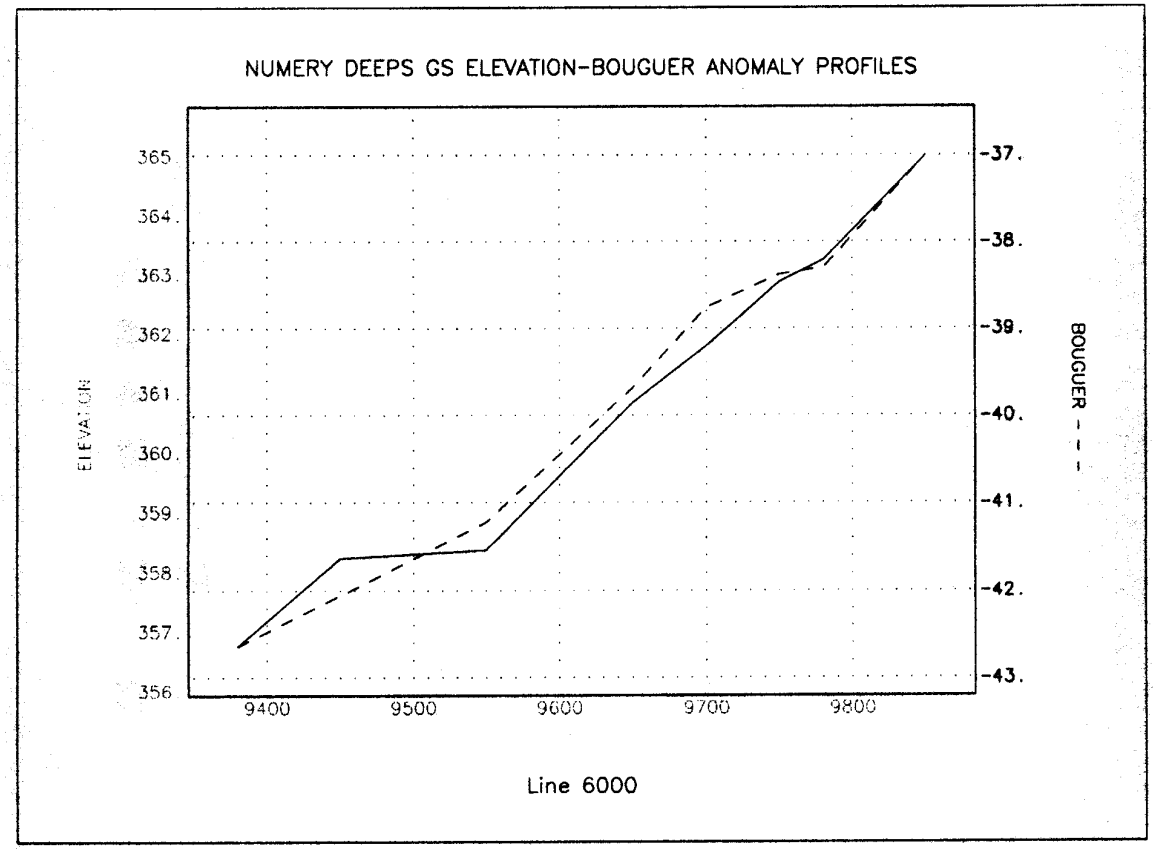
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364.
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359.
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-37.
-38.
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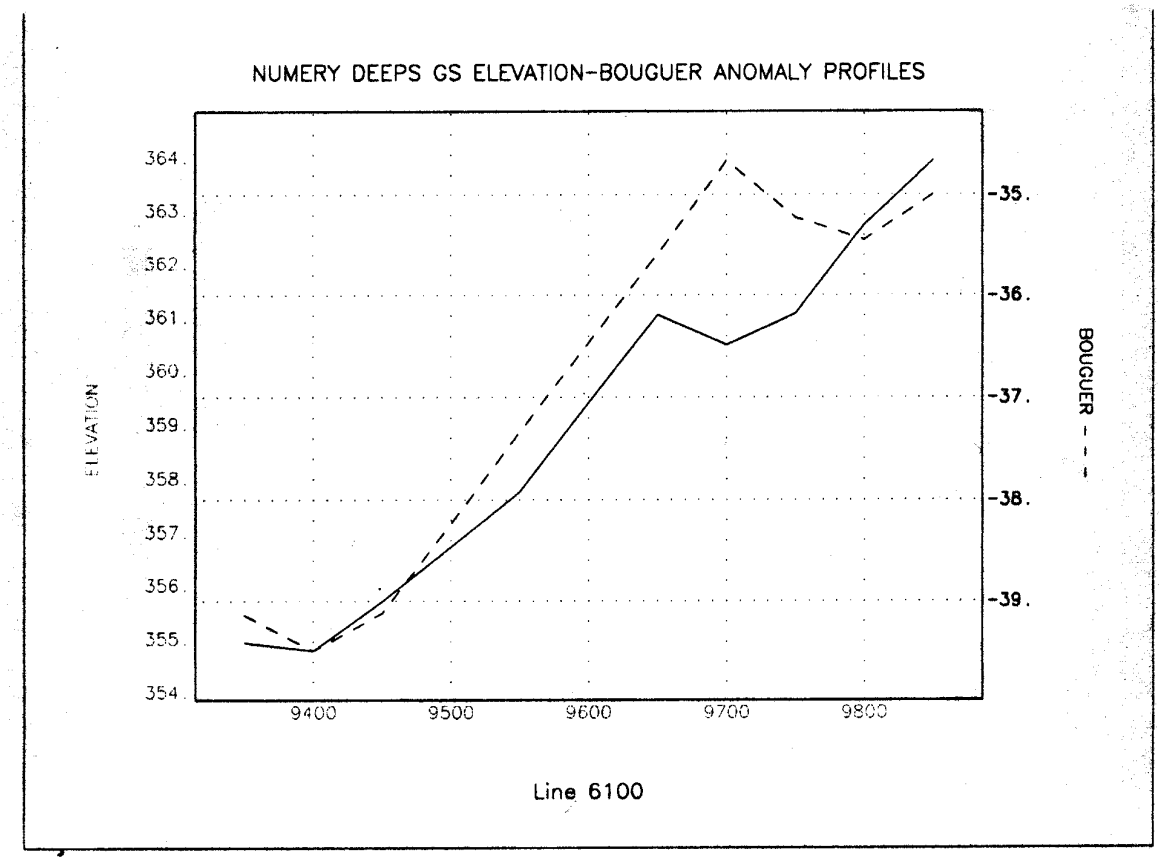
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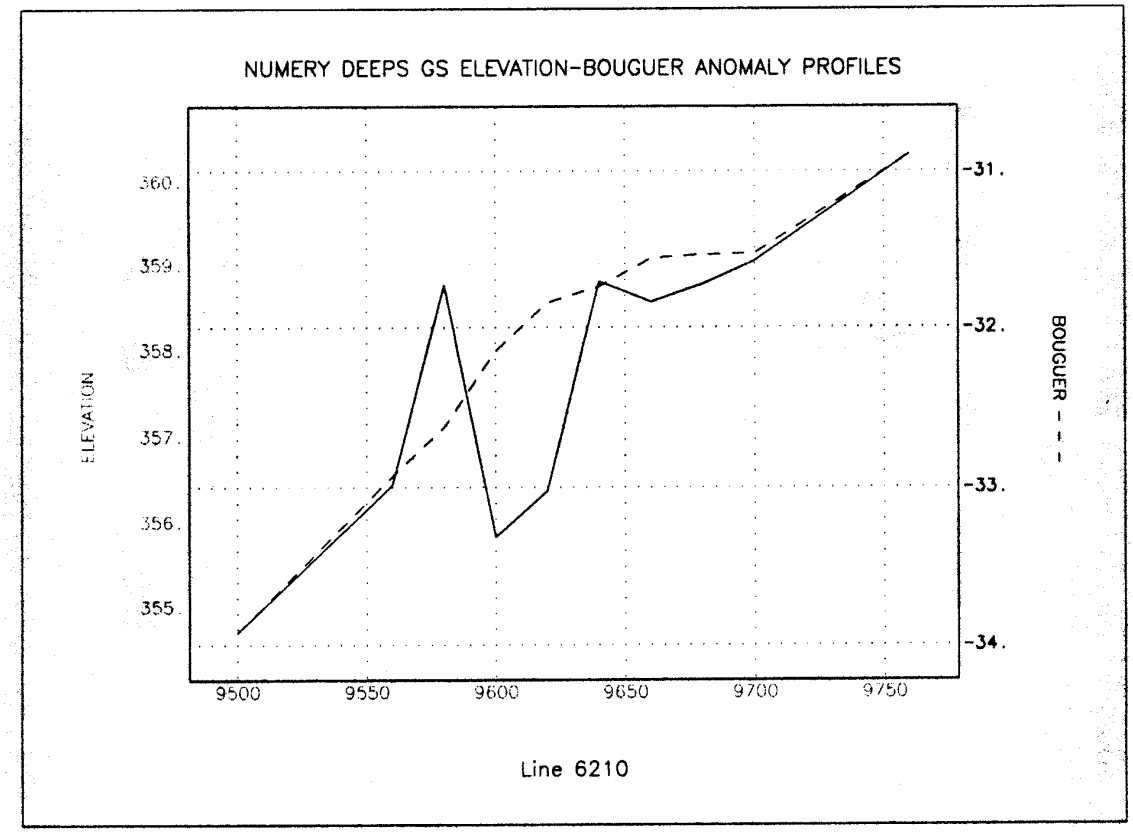
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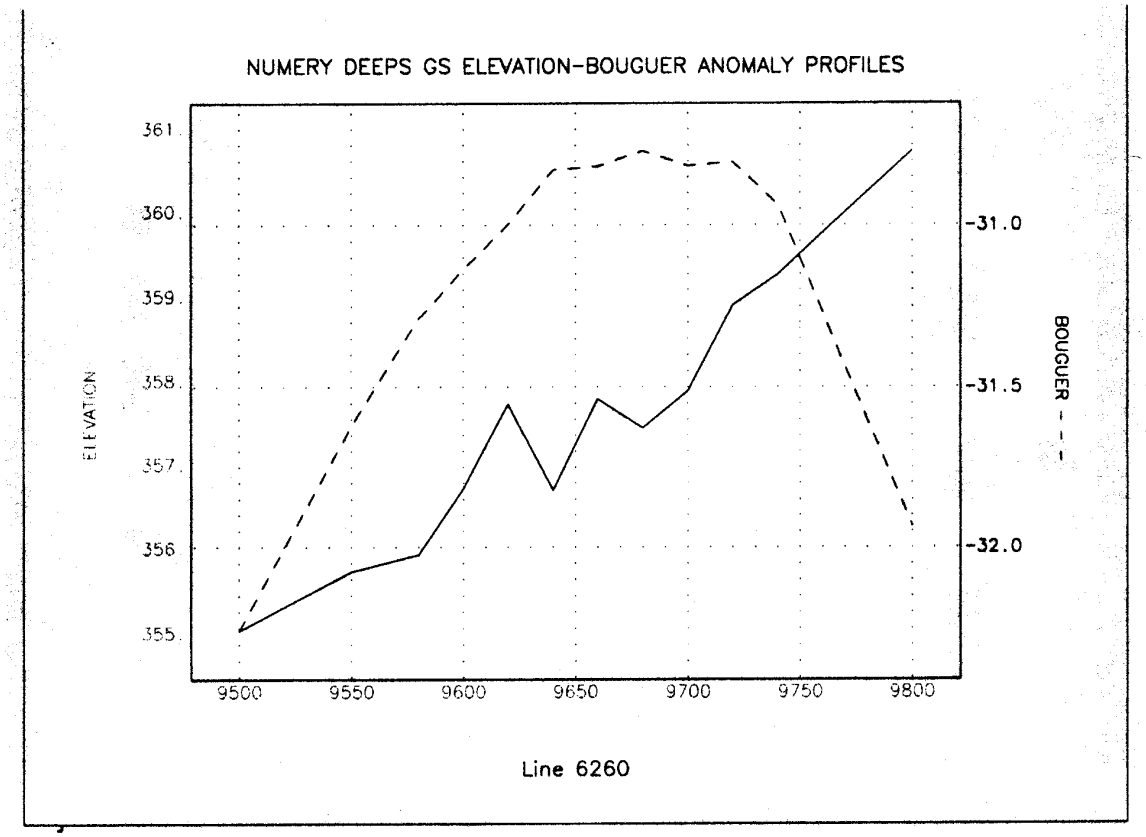
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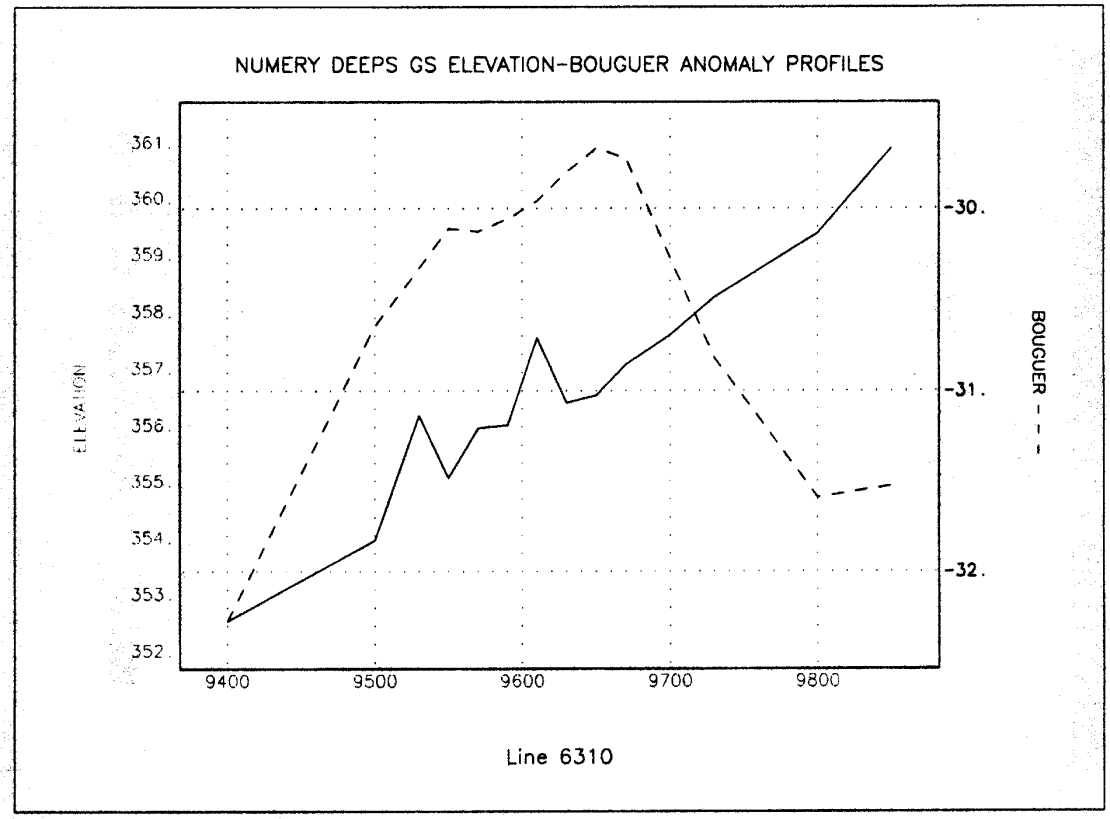
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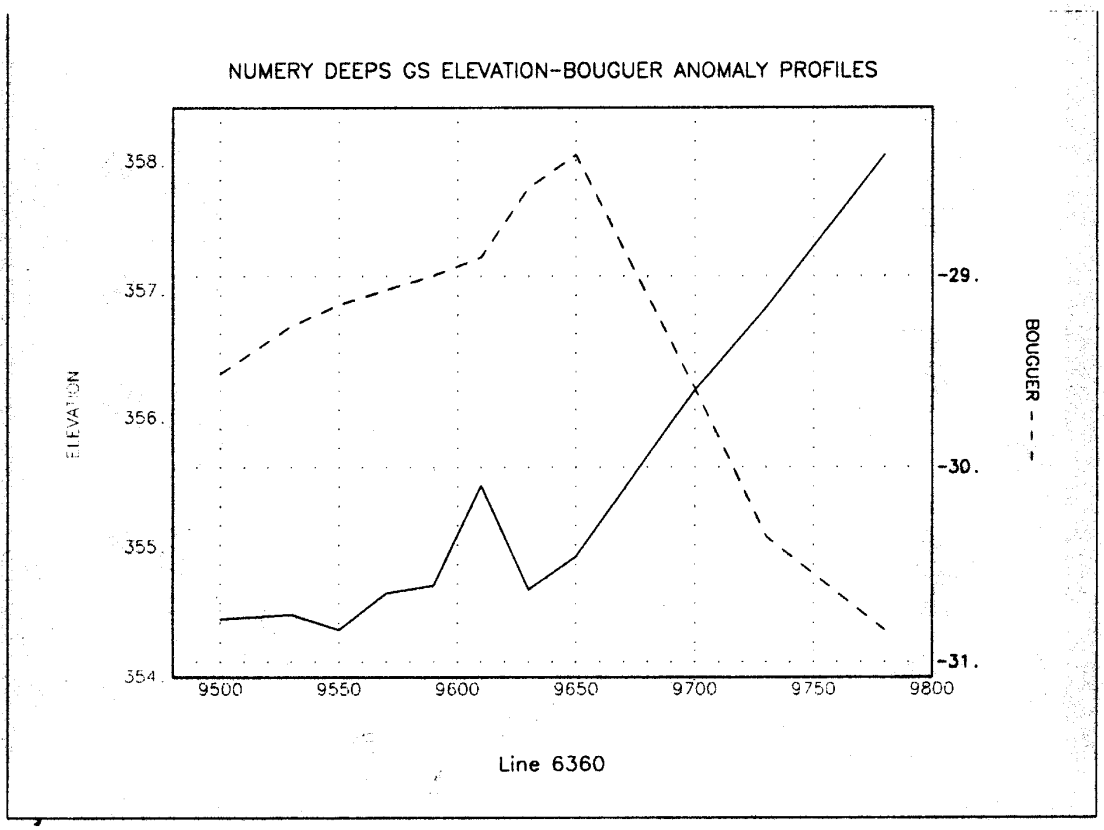
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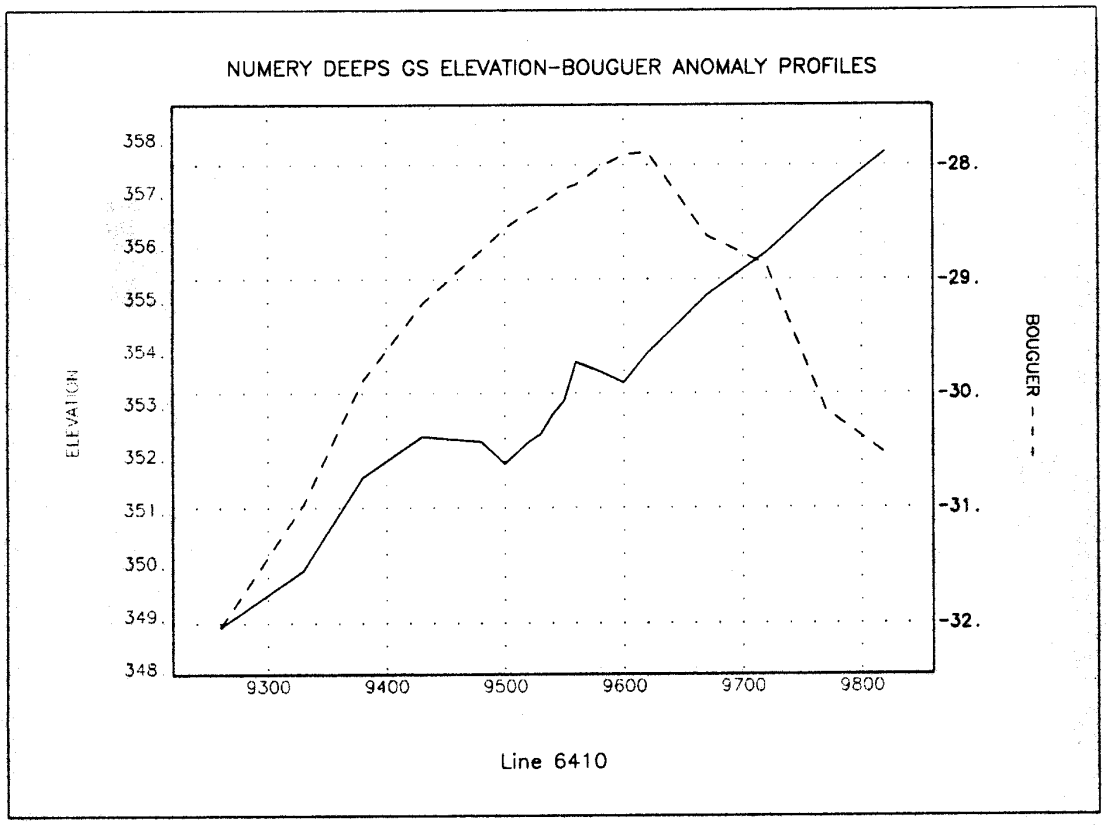
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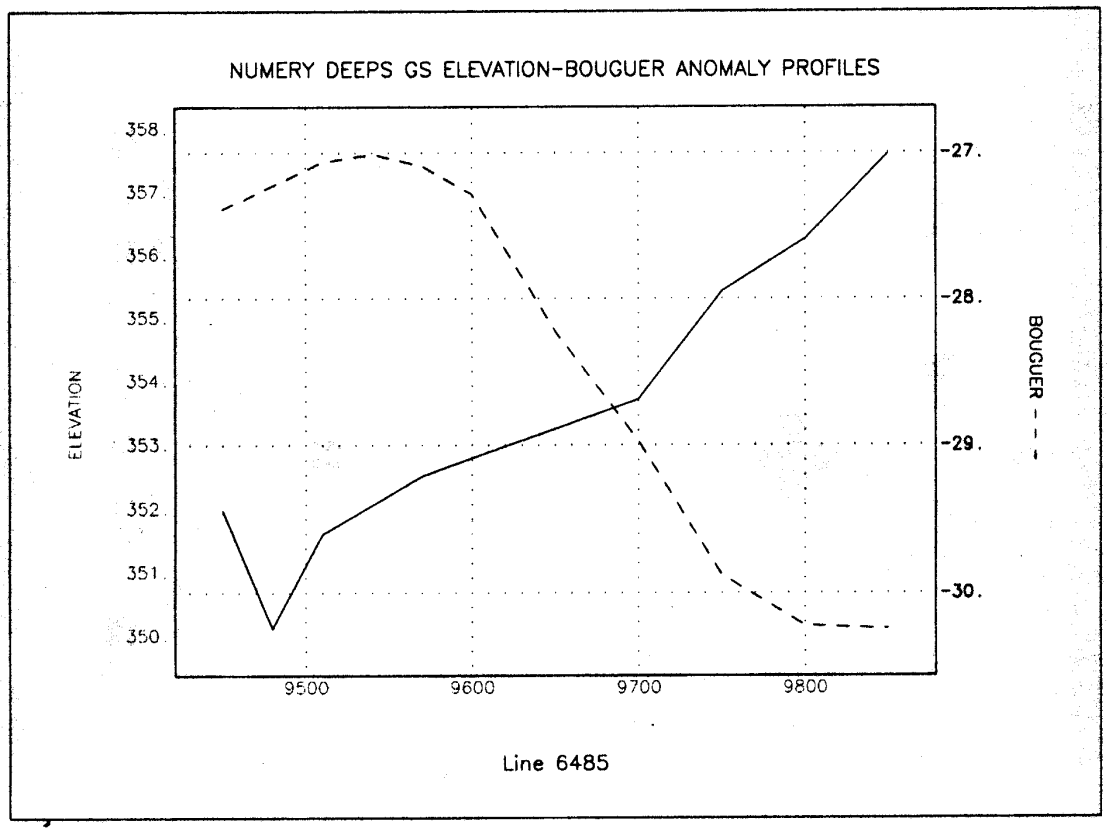
Line 6410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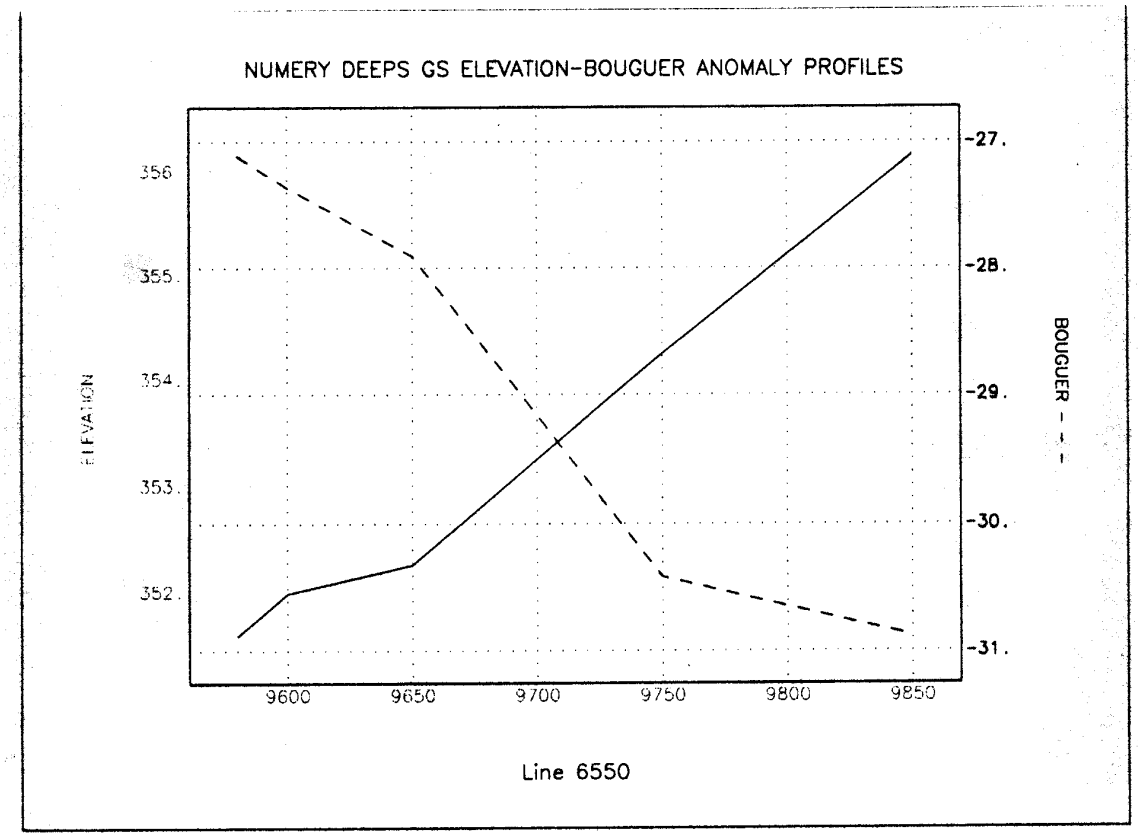
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354.
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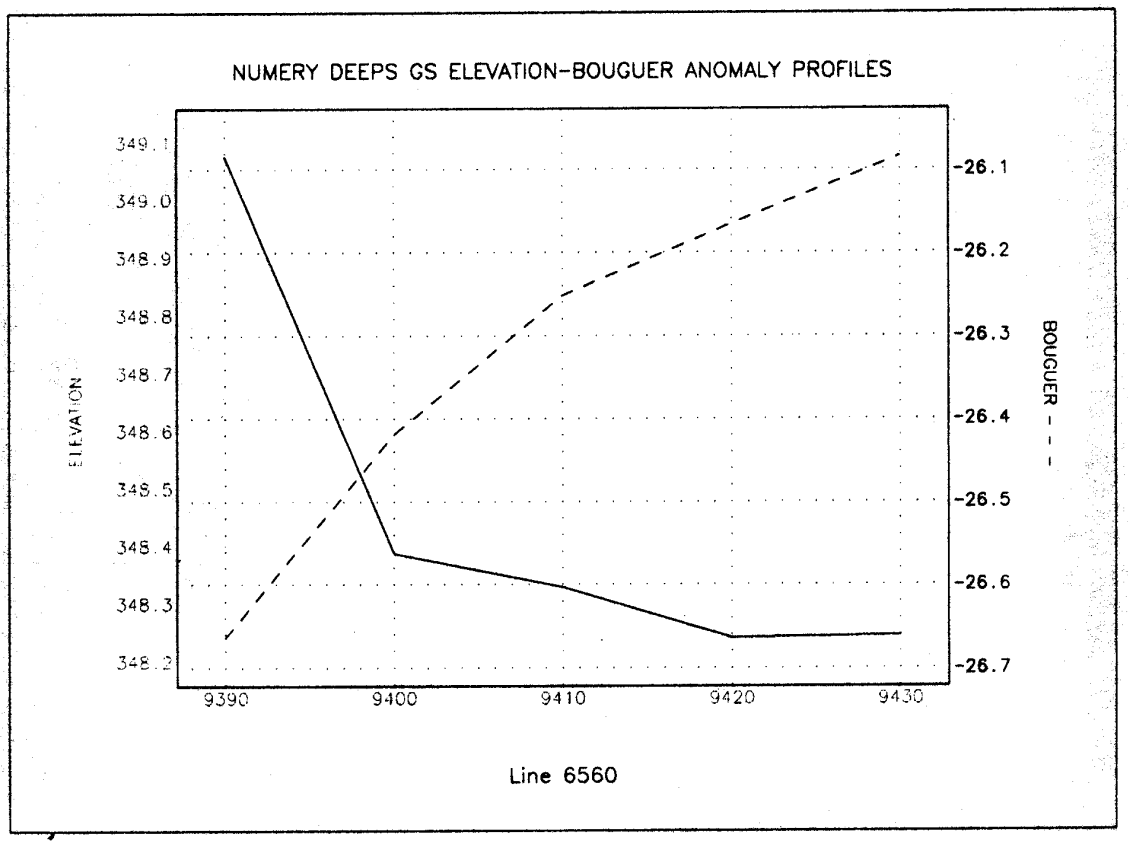
Line 6550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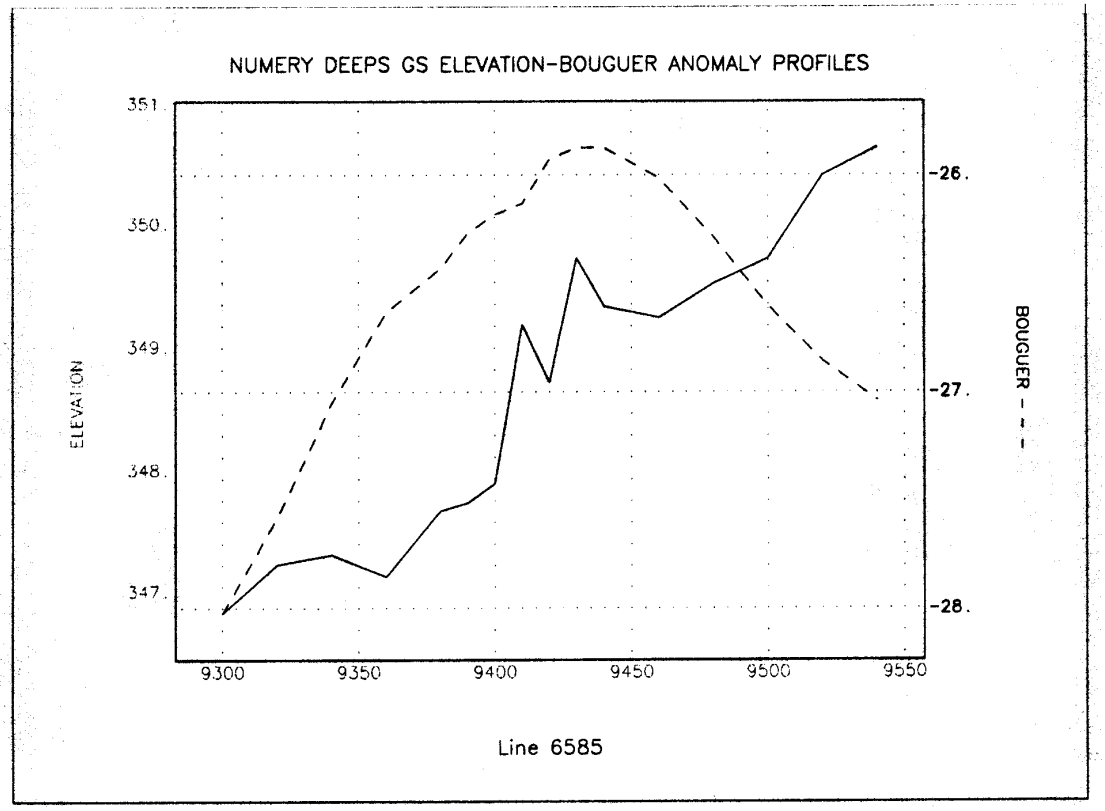
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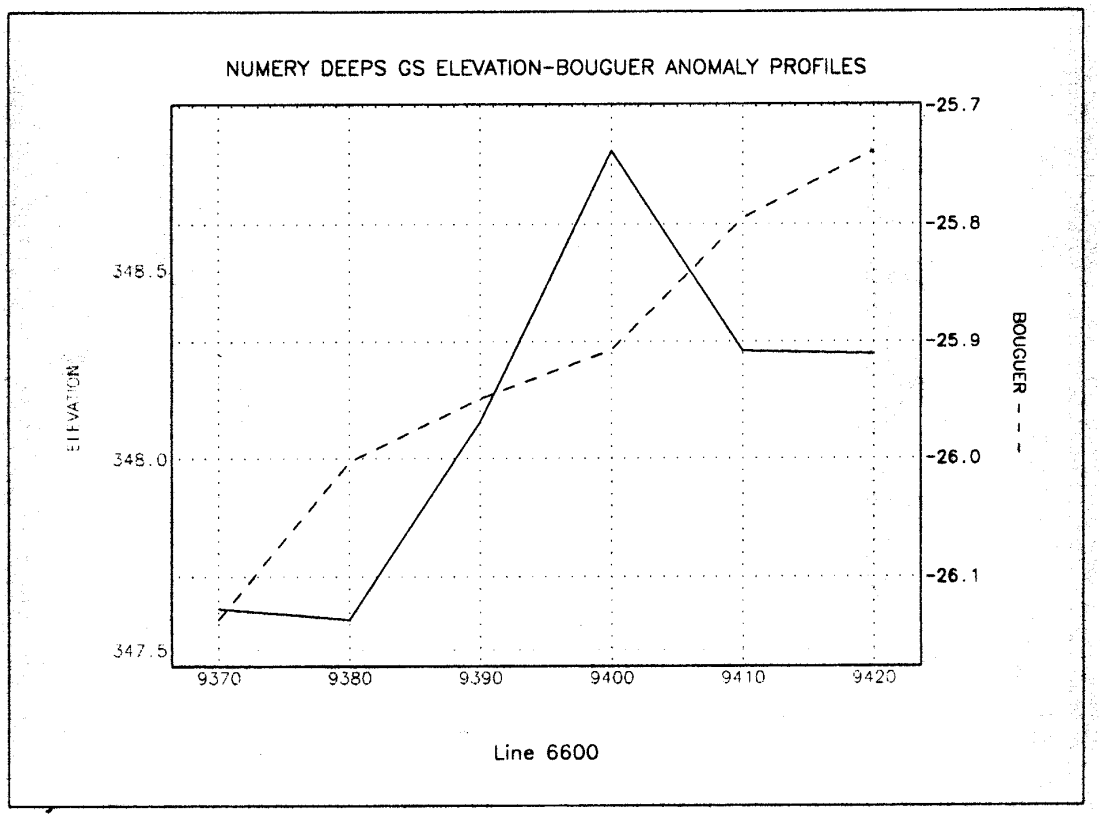
Line 6585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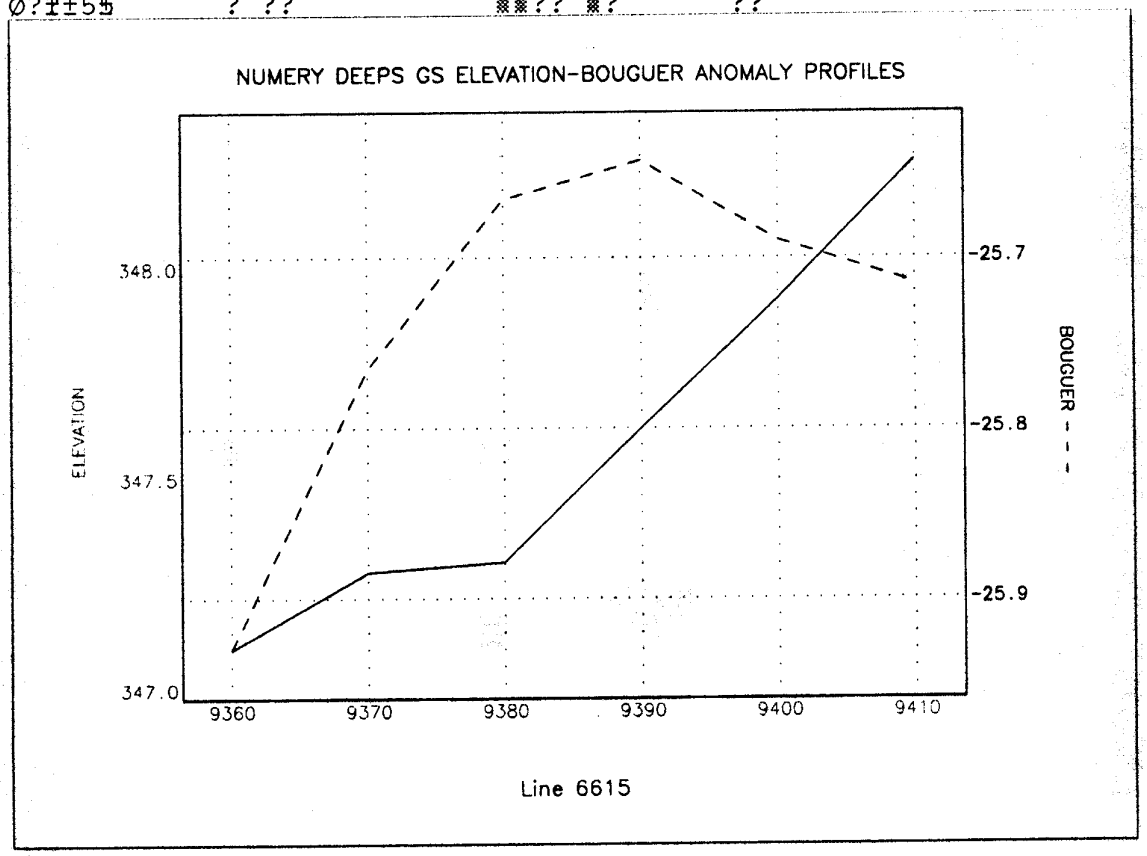
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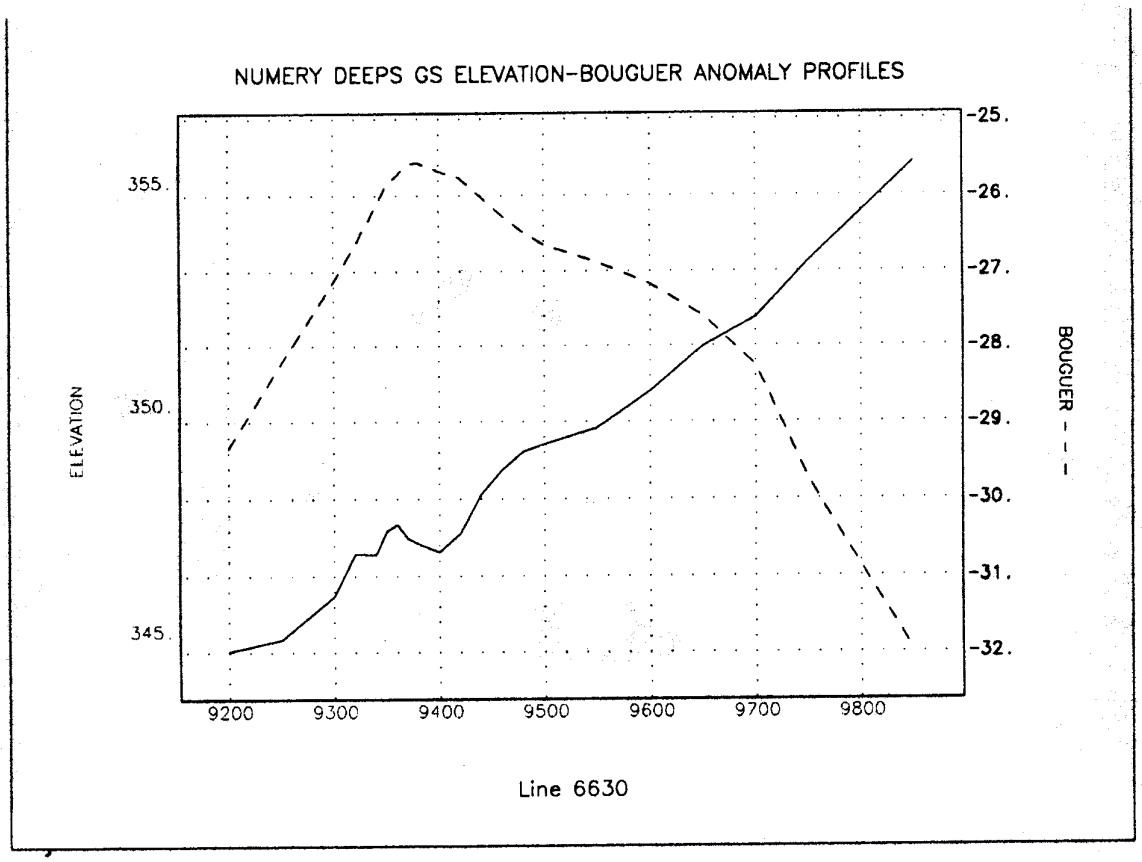
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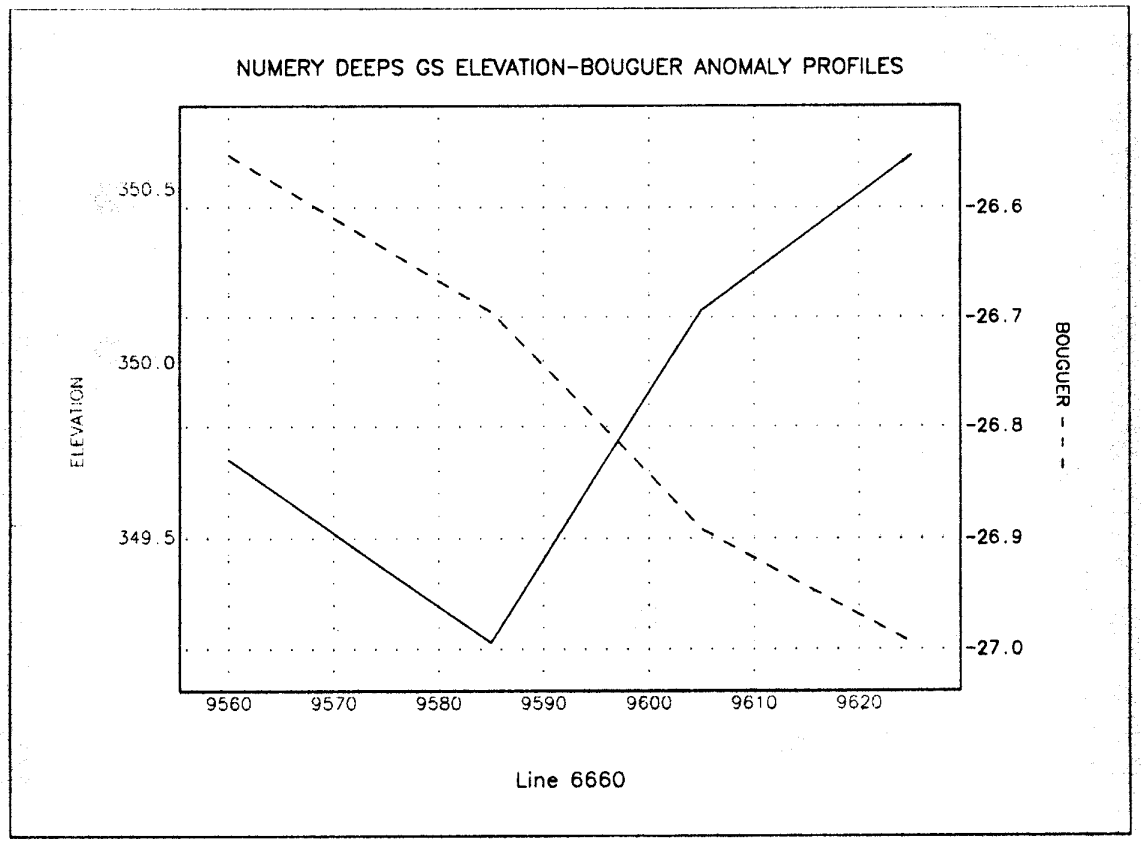
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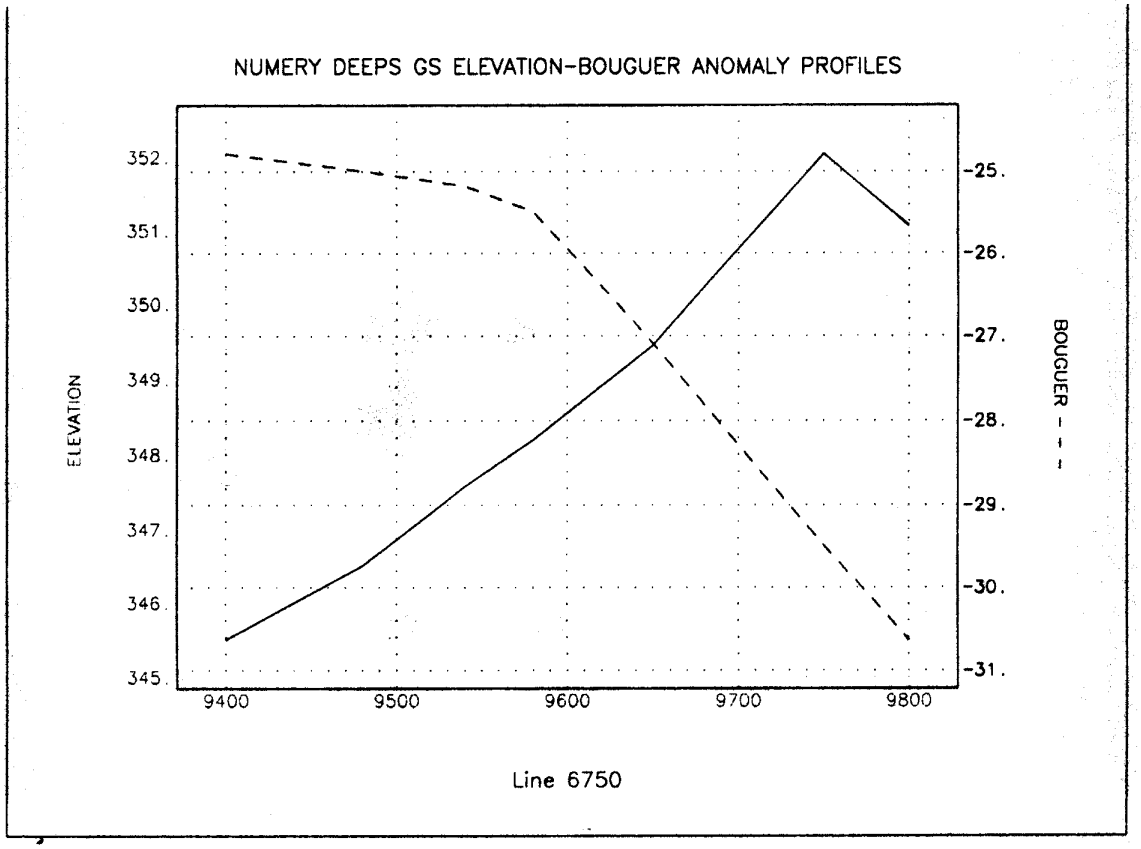
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