

UR1983-28

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1983/28. A FORTRAN program for the drift correction of gravity data
(Revision 3).

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Abstract

This program removes a linear drift from gravity readings made at times between the occupation of pairs of base stations. The base stations need not be the same.

THE PROGRAM

GRVDFT (Appendix 1)

Earlier versions of this program (Richardson and Leaman, 1981; Richardson, 1981) calculated drift between a single pair of base stations. The program now allows drift calculations between a succession of base stations and prints a record of all data entry and gravity differences.

The program reads station numbers, station times, and meter readings on logical unit 5 and prints drift and datum corrected differences on logical units 6 and 7. All times are in 24 hour notation, with a decimal point separating the hours and minutes (e.g. 10.25).

All data is read in free format. Data should be input in the order first base station, second base station, stations between these two base stations, third base station, stations between the second and third base stations, fourth base station, data between the third and fourth base stations, etc.

The data for each base station is:

SNUM - the base station number
TIME - the time of reading the base station
BASE - the meter reading at the base station
SHIFT - any shift to be applied to the base value to correct it to the datum (in the same units as BASE). If the station number is the same as that of the last base station, SHIFT is not required.

The data for each station is:

SNUM - the station number. If SNUM = 0 the program asks for another base station. If there is no other base station, accumulated data is then printed and the program stops.
STIME - the time of reading the station
STNVAL - the station reading (in the same units as BASE)

Output is:

Logical Unit 6: The base station data, and then for each station the base station number (reset to one at the start of a run) from which the difference has been calculated, the drift (and datum) corrected difference, the reading time, and the uncorrected reading. Appendix 2 shows a sample output.

Logical Unit 7: The drift (and datum) corrected difference. This output appears only if the user requests the differences to be printed immediately.

REFERENCES

RICHARDSON, R.G.; LEAMAN, D.E. 1981. FORTRAN program for the drift correction of gravity data. *Unpubl.Rep.Dep.Mines Tasm.* 1981/37.

RICHARDSON, R.G. 1981. A revised FORTRAN program for the drift correction of gravity data. *Unpubl.Rep.Dep.Mines Tasm.* 1981/49.

[11 July 1983]

APPENDIX 1
Program GRVDFT

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$TITL  GRVDFT.FTN  -   GRAVITY DRIFT CORRECTION
C  TITLE GRVDFT
C  A PROGRAM TO REMOVE A LINEAR DRIFT FROM GRAVITY READINGS
C  RELATIVE TO A SERIES OF BASE STATIONS WHICH MAY OR MAY NOT BE THE SAME
C  AND MAY OR MAY NOT BE THE SURVEY DATUM.
C  TIMES MUST BE IN 24 HOUR NOTATION
C  OUTPUT TO THE PRINTER IS STORED IN ARRAYS AND PRINTED AT THE END OF
C  THE RUN
      INTEGER*2  SNUM(150), BNUM(20), BSNUM(150), K, AOK, YES, NO, I
      LOGICAL  IER
      REAL  TIME1, TIME2, BTIME(20), BBASE(20), BSHIFT(20), DRIFT, STIME,
      STNVAL(150), VALUE(150), ATIME(150), ATIME1, ATIME2
      DATA  YES/1HY/, NO/1HN/
      K=1
      JBASE=1
      OPEN(UNIT=6, FILE='PR: ')
      OPEN(UNIT=5, FILE='CON: ')
C  SET LOGICAL UNIT 6 TO PRINTER, 5 TO INPUT DEVICE
      WRITE(5,110)
110  FORMAT(' PRINT DIFFERENCES IMMEDIATELY?')
      READ(5,111) AOK
1.1.1  FORMAT(A1)
      IF (AOK .EQ. YES) OPEN(UNIT=7, FILE='CON: ')
      IF (AOK .NE. YES) OPEN(UNIT=7, FILE='NULL: ')
C  IF OUTPUT NOT WANTED SET LOGICAL UNIT 7 TO A NULL DEVICE
      WRITE(5,96)
      96  FORMAT(' BASE 1 NUMBER?')
      READ(5,*) BNUM(JBASE)
      55  WRITE(5,100)
100  FORMAT(' BASE 1 TIME?')
      READ(5,101) TIME1
101  FORMAT(F10.1)
C  READ TIME AS E. G. 10.56 FOR TEN FIFTY-SIX
C  MUST BE IN 24 HOUR FORMAT
      IF (TIME1 .GT. 24.0) GOTO 55
C  NO DECIMAL POINT IN TIME1
      BTIME(JBASE)=TIME1
C  SAVE FOR LATER PRINT
      CALL HOURS(TIME1)
C  CORRECTION TO HOURS
      WRITE(5,102)
102  FORMAT(' BASE 1 READING?')
      READ(5,*) BBASE(JBASE)
      WRITE(5,103)
103  FORMAT(' BASE 1 SHIFT?')
      READ(5,*) BSHIFT(JBASE)
      50  JBSL1=JBASE
      JBASE=JBASE+1
      WRITE(5,97) JBASE
      97  FORMAT(' BASE ', I2, ' NUMBER?')
      READ(5,*) BNUM(JBASE)
      56  WRITE(5,104) JBASE
104  FORMAT(' BASE ', I2, ' TIME?')
      READ(5,101) TIME2
C  MUST BE IN 24 HOUR FORMAT
      IF (TIME2 .GT. 24.0) GOTO 56
C  TIME HAS NO DEC. PT.
      BTIME(JBASE)=TIME2

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C SAVE FOR LATER PRINT
  CALL HOURS<TIME2>
  WRITE<5,105> JBASE
105 FORMAT<' BASE ',I2,' READING?>
  READ<5,*> BBASE<JBASE>
  DO 30 I=1,JBSL1
  IF <BNUM<JBSL1> .NE. BNUM<JBASE>> GOTO 30
  BSHIFT<JBASE>=BSHIFT<JBSL1>
C IF THE SAME BASE STATION JUST COPY THE SHIFT
  GOTO 31
  30 CONTINUE
C IF FALL OUT OF DO 30 LOOP HAVENT HAD THAT NUMBER BASE BEFORE
  WRITE<5,106> JBASE
106 FORMAT<' BASE ',I2,' SHIFT?>
  READ<5,*> BSHIFT<JBASE>
C HAVE READ THE BASE STATION PARAMETERS
C
C NOW CALCULATE THE DRIFT PER HOUR
  31 DTEMP=BBASE<JBSL1>-BSHIFT<JBSL1>
  DRIFT=((<BBASE<JBASE>-BSHIFT<JBASE>)-DTEMP)/<TIME2-TIME1>
C
  9 WRITE<5,98>
  98 FORMAT<' STN. NO. ?>
  READ<5,*> SNUM<K>
  IF <SNUM<K> .EQ. 0> GOTO 20
C TERMINATE INTERVAL BETWEEN BASES BY 0 STATION NUMBER
  10 WRITE<5,107>
107 FORMAT<' STN TIME?>
  READ<5,101> STIME
  IF <STIME .GT. 24.0> GOTO 10
C TIME HAS NO DEC. PT.
  ATIME<K>=STIME
C STORE THE TIME FOR THE PRINT AT THE END
  CALL HOURS<STIME>
  WRITE<5,108>
108 FORMAT<' STN VALUE?>
  READ<5,*> STNVAL<K>
  BSNUM<K>=JBSL1
C REMEMBER WHICH BASE THE DIFF IS CALCULATED RELATIVE TO
C
C NOW CALCULATE DRIFT CORRECTED VALUE
  VALUE<K>=STNVAL<K>-<DRIFT*<STIME-TIME1>-DTEMP>
  WRITE<7,109> VALUE<K>
109 FORMAT<' VALUE',F9.1>
  K=K+1
C OK SO INCREMENT COUNTER BY ONE
  GOTO 9
  20 WRITE<5,112>
112 FORMAT<' ANOTHER BASE STATION?>
  READ<5,111> AOK
  IF <AOK .EQ. NO> GOTO 22
  IF <AOK .NE. YES> GOTO 20
  TIME1=TIME2
  GOTO 50
  22 K=K-1
  IF <K .EQ. 0> GOTO 21
C NO STATIONS
  WRITE<6,200>
200 FORMAT<' BASE SNUM TIME OBS SHIFT>
  WRITE<6,203> <I,BNUM<I>,BTIME<I>,BBASE<I>,BSHIFT<I>,I=1,JBASE>

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203 FORMAT(I5, I6, F6. 2, 2F9. 1)
WRITE(6, 204)
204 FORMAT(/' BASE  SNUM      DIFF      TIME      OBS')
WRITE(6, 201) (BSNUM(I), SNUM(I), VALUE(I), ATIME(I), STNVAL(I), I=1, K)
201 FORMAT(I5, I6, F9. 1, F9. 2, F9. 1)
WRITE(6, 202)
202 FORMAT(////)
2:1 STOP
END
SUBROUTINE HOURS(TIME)
REAL HR, MINS, TIME
HR=IFIX(TIME+0.005)
C ENSURE TIME ROUNDS DOWN TO THE CORRECT HOUR
MINS=TIME-HR
C MINUTES
MINS=MINS*1.666667
C CONVERT MINUTES TO DECIMAL HOURS
TIME=HR+MINS
RETURN
END
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APPENDIX 2

Sample output

| BASE | SNUM | TIME | OBS | SHIFT |
|------|------|-------|-------|-------|
| 1 | 9905 | 9.20 | 819.8 | 0.0 |
| 2 | 9905 | 18.58 | 817.1 | 0.0 |
| 3 | 9905 | 7.13 | 820.8 | 0.0 |
| 4 | 9905 | 13.20 | 823.4 | 0.0 |

| BASE | SNUM | DIFF | TIME | OBS |
|------|------|-------|-------|--------|
| 1 | 1551 | 581.0 | 15.36 | 1399.0 |
| 3 | 1565 | 578.3 | 9.22 | 1400.0 |
| 3 | 1582 | 573.0 | 10.07 | 1395.0 |