1983/70.   A FORTRAN program for the drift correction of gravity data
          (Revision 4).

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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 are 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, stations between the third and fourth base
stations, *etc.*

          The data for each base station are:

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 are:

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.

[13 December 1983]

APPENDIX 1

Program GRVDFT

```fortran
$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
  111 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
    8 WRITE(5,96)
   96 FORMAT(' BASE 1 NUMBER?')
      READ(5,*,ERR=8) 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
   11 WRITE(5,97) JBASE
   97 FORMAT(' BASE ',I2,' NUMBER?')
      READ(5,*,ERR=11) 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
```

```
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(I) .NE. BNUM(JBASE)) GOTO 30
      BSHIFT(JBASE)=BSHIFT(I)
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,*,ERR=9) 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)
      IF (STIME .LE. TIME1 .OR. STIME .GE. TIME2) GOTO 10
C ENSURE THAT THE TIME GIVEN LIES BETWEEN THE BASE STATION TIMES
      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)
```

```fortran
200 FORMAT(' BASE  SNUM  TIME      OBS      SHIFT')
    WRITE(6,203) (I,BNUM(I),BTIME(I),BBASE(I),BSHIFT(I),I=1,JBASE)
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(////)
 21 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
```

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