1982/4. A FORTRAN program for the drift correction of gravity data
(Revision 2)

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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). Non-standard sub-
routine calls are:

        CALL SYSCOM (I, 'AS 0622, 0720, 0899*') sets the logical units for
                the printer, optional output, and the core buffer

        CALL SYSCOM (I, 'AS 0700*') sends the optional output to the null
                device

        CALL SYSCOM (I, 'AS 0620, 0720, 0820*') resets the logical units to
                the system console.

Station numbers are read in free integer format using subroutine
INFREE, and all other data is read in F10.1 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)

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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.

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.

[19 February 1982]

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APPENDIX 1

Program GRVDFT

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$TITL 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),FFEED,BNUM(20),BSNUM(150),K,AOK,YES,NO,I
        IMPLICIT INTEGER*2 (I-N)
        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/,FFEED/3072/
        K=1
        JBASE=1
        CALL SYSCOM(I,'AS 0622,0720,0899*')
C SET LOGICAL UNIT 6 TO PRINTER,7 TO INPUT DEVICE,8 TO CORE BUFFER
        WRITE(5,110)
  110 FORMAT(' PRINT DIFFERENCES IMMEDIATELY?')
        READ(5,111) AOK
  111 FORMAT(A1)
        IF (AOK .NE. YES) CALL SYSCOM(I,'AS 0700*')
C IF OUTPUT NOT WANTED SET LOGICAL UNIT 7 TO A NULL DEVICE
        WRITE(5,96)
   96 FORMAT(' BASE 1 NUMBER?')
        CALL INFREE(BNUM(JBASE),IER,5)
   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(5,101) BBASE(JBASE)
        WRITE(5,103)
  103 FORMAT(' BASE 1 SHIFT?')
        READ(5,101) BSHIFT(JBASE)
   50 JBSL1=JBASE
        JBASE=JBASE+1
        WRITE(5,97) JBASE
   97 FORMAT(' BASE ',I2,' NUMBER?')
        CALL INFREE(BNUM(JBASE),IER,5)
   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
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105 FORMAT(' BASE ',I2,' READING?')
    READ(5,101) BBASE(JBASE)
    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 WRITE(5,106) JBASE
106 FORMAT(' BASE ',I2,' SHIFT?')
    READ(5,101) 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. ?')
    CALL INFREE(SNUM(K),IER,5)
    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(5,101) 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) FFEED
200 FORMAT(A1,' 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)
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  202 FORMAT(////)
   21 CALL SYSCOM(I,'AS 0620,0720,0820*')
C RE-ASSIGN ALL LOGICAL UNITS TO THE INPUT DEVICE
      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
```