

1985/23. CONCOORD - A program for conversions between the Australian Map Grid and geographic co-ordinates.

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Abstract

The program described is used for converting from numeric co-ordinates on the Australian Map Grid to latitude and longitude co-ordinates, or vice versa, within the Tasmanian area.

USING THE PROGRAM

The program (Appendix 1) is run on the Department of Mines Perkin-Elmer mini-computer by typing CONCOORD. The program prompts for the type of conversion, either latitude/longitude to AMG or AMG to latitude/longitude.

(a) Latitude/longitude to AMG

Enter the latitude in the form DEG MIN SEC.CC
or DEG MIN.NN O

Note that the trailing 0 must be used.

Enter the longitude.

If more calculations are to be performed type Y at the prompt.

(b) AMG to latitude/longitude

Enter the easting in kilometres. e.g. 347.2

Enter the northing in kilometres without the leading 5.

If more calculations are to be performed type Y at the prompt.

[2 May 1985]

APPENDIX 1
Program CONCOORD

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*CONCOORD.CSS - TO RUN CONCOORD COORD. CONVERSION PROGRAM  
L CONCOORD: AS 5.CON:; ST  
#EXIT
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#TITLE CONCOORD - CONVERSION OF COORDINATES
C FOR CONVERTING FORM LAT/LONG TO A. M. G. COORDS OR VICE VERSA
C IN THE TASMANIAN AREA.
  REAL*8 EAST,NORTH
  REAL*4 AR(6)
 10 WRITE(5,100)
100 FORMAT(' CONVERT FROM LAT/LONG TO A. M. G. (L)'/
          ' OR FROM A. M. G. TO LAT/LONG (A)?')
  READ(5,101) OPT
101 FORMAT(A1)
  IF (OPT .EQ. 'L') GOTO 20
C LAT/LONG TO AMG
  IF (OPT .NE. 'A') GOTO 10
C NOT VALID OPTION
C
C AMG TO LAT/LONG
 11 WRITE(5,200)
200 FORMAT(' ENTER A. M. G. EASTING IN KM. E. G. 347.201')
  READ(5,*) EAST
  EAST=EAST*1000.0D00
  WRITE(5,201)
201 FORMAT(' ENTER A. M. G. NORTHING IN KM. OMITTING LEADING 5'/
          ' E. G. 426.071')
  READ(5,*) NORTH
  NORTH=NORTH*1000.0D00
  CALL GEOGRF(EAST,NORTH,AR)
  LATD=AR(1)
  LATM=AR(2)
  LOND=AR(4)
  LONM=AR(5)
  WRITE(5,202) LATD,LATM,AR(3),LOND,LONM,AR(6)
202 FORMAT(I3,'D',I3,'M',F6.2,'S S',I9,'D',I3,'M',F6.2,'S E')
  CALL MORE
  GOTO 11
C
C
C LAT/LONG TO AMG
 20 CONTINUE
  WRITE(5,300)
300 FORMAT(' ENTER LATITUDE IN FORM 42 36 24 OR 42 36.4 0')
  READ(5,*) ALATD,ALATM,ALATS
  WRITE(5,301)
301 FORMAT(' ENTER LONGITUDE IN FORM 147 36 24 OR 147 36.4 0')
  READ(5,*) ALOND,ALONM,ALONS
  CALL GEOUTM(ALATD,ALATM,ALATS,ALOND,ALONM,ALONS,EAST,NORTH)
  WRITE(5,302) EAST,NORTH
302 FORMAT(F9.1,'ME',F10.1,'MN')
  CALL MORE
  GOTO 20
  END
  SUBROUTINE MORE
  WRITE(5,100)
100 FORMAT(' MORE DATA?')
  READ(5,101) OPT
101 FORMAT(A1)
  IF (OPT .EQ. 'N') STOP
  END
$INCLUDE GEOGRF.FTN,-
$INCLUDE GEOUTM.FTN,-

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\$TITLE GEOUTM GRID CONVERSION

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SUBROUTINE GEOUTM(ALATD, ALATM, ALATS, ALOND, ALONM, ALONS, EAST, YNORTH)
C BASED ON THE TAS LANDS DEPT PROGRAM UTM
C THE EQUATIONS USED ARE FROM TM PROJECTION TABLES 1944.
C THE ORIGINAL FORMULAE AGREE WITH REDFEARNS FOR THE 1ST. AND
C 2ND. TERMS BUT DIFFER IN THE 3RD. TERM. HOWEVER TO IMPROVE
C ACCURACY THE FORMULA FOR NORTHING HAS BEEN CHANGED TO AGREE
C WITH REDFEARNS IN THE 3RD. TERM (Q3)
C CONVERTS FROM GEOGRAPHIC TO UTM COORDINATES
C INPUT IS LATDEG, LATMIN, LATSEC
C          LONDEG, LONMIN, LONSEC
C OUTPUT IS EAST COORDINATE, NORTH COORDINATE (DOUBLE PRECISION, METRES)
DOUBLE PRECISION DEG, S, EAST, YNORTH, SIND, COSD, TAND, C, R, P, PC, PCC,
P1, P2, Q1, Q2, Q3, Q4, Q5, Q6
DEG=DBLE(ALATD)+DBLE(ALATM)/60. 0D00+DBLE(ALATS)/3600. 0D00
S=111133. 34878D00*DEG-16038. 9546D00*DSIN(0. 034906585D00*DEG)+
16. 8331D00*DSIN(0. 0698132D00*DEG)-0. 0218D00*DSIN(0. 10472D00*DEG)
DEG=0. 01745329252D00*DEG
SIND=DSIN(DEG)
COSD=DCOS(DEG)
TAND=(SIND/COSD)**2
C=1. 0D00-0. 6694541855D-2*SIND**2
R=6335461. 141D00/C**1. 5
P=6378160. 0D00/DSQRT(C)
PC=P*COSD
PCC=PC*COSD**2
P1=(DBLE(ALONS)+DBLE(ALONM)*60. 0D00+DBLE(ALOND)*3600. 0D00
-529200. 0D00)*1. D-4
P2=P1**2
Q1=1. D+7-0. 9996D00*S
Q2=PC*SIND*0. 117475144D-2
Q3=PCC*SIND*(4. 0D00*(P/R)**2+P/R-TAND)*0. 230099D-6
Q4=PC*0. 48461975563D-1
Q5=PCC*(P/R-TAND)*0. 18984519D-4
Q6=PCC*COSD*COSD*(5. 0D00-TAND*(18. 0D00-TAND))*0. 22311D-8
EAST=500000. 0D00+P1*(Q4+P2*(Q5+P2*Q6))
YNORTH=Q1-P2*(Q2+P2*Q3)
RETURN
END

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SUBROUTINE GEOGRF(EAST, NORTH, ANSWER)

DOUBLE PRECISION NORTH, EAST

REAL ANSWER(6)

DOUBLE PRECISION TMD1, ORTH, DEG, TMD2, CON, Q1, DOG, SIND, COSD,

TAND, TANSQ, SINSEC, C, D, DTAN, R, P, PCUBE, POR, PFIVE, P1, P2, P3, P4,

P5, GLAT, TEMPL, DLONG, DC, SLO, SLA

DOUBLE PRECISION VAL(16), Q(5)

INTEGER*2 I, IDLA, MLA, IDLO, MLO

C CONVERTS AMG GRID COORDS (IN METRES) TO LATS AND LONGS

C INPUT OF NORTH COORDINATE EXCLUDES LEADING 5 FOR USE IN TASMANIA

C E. G. 5326446. 014 BECOMES 326446. 014

VAL(1)=9. 033D-06

VAL(2)=1. 1113334878D05

VAL(3)=3. 4906585D-02

VAL(4)=6. 901317D-02

VAL(5)=1. 04719755D-01

VAL(6)=9. 008D-06

VAL(7)=1. 745329252D-02

VAL(8)=0. 66945418546D-02

VAL(9)=1. 99840032D-08

VAL(10)=23. 96162303D-20

VAL(11)=5. 9928028794D-14

VAL(12)=119. 76019192D-26

VAL(13)=2. 9964014397D-14

VAL(14)=14. 970023989D-26

VAL(15)=6. 3354611409D06

VAL(16)=1. 60389546D04

C

ORTH=NORTH+5. 0D06

C ADD THE LEADING 5 TO THE NORTH COORDINATE

TMD1=1. 0D07-ORTH

DEG=VAL(1)*TMD1

C

DO 10 I=1,10

TMD2=VAL(2)*DEG-VAL(16)*DSIN(VAL(3)*DEG)+

16. 83310D00*DSIN(VAL(4)*DEG)-0. 0218D00*DSIN(VAL(5)*DEG)

CON=TMD1-0. 9996D00*TMD2

IF (DABS(CON) .LT. 1. 0D-03) GOTO 14

DEG=DEG+VAL(6)*CON

10 CONTINUE

GOTO 16

C

14 CONTINUE

Q1=(EAST-500000. 0D00)*1. 0D-06

Q(1)=Q1

DO 11 I=2,5

Q(I)=Q(I-1)*Q1

11 CONTINUE

DOG=VAL(7)*DEG

SIND=DSIN(DOG)

COSD=DCOS(DOG)

TAND=SIND/COSD

TANSQ=TAND*TAND

SINSEC=0. 48401368111D-05

C=1. 0D00-VAL(8)*SIND*SIND

D=0. 27777777778D01

DTAN=D*TAND

R=VAL(15)/C**1. 5

P=637816. 0D01/C**0. 5

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PCUBE=P**3
POR=P/R
PFIVE=PCUBE*P*P
P1=DTAN/(VAL(9)*R*P*SINSEC)
P2=DTAN*(5.0D00+3.0D00*TANSQ)/(VAL(10)*R*PCUBE*SINSEC)
P3=D/(P*COSD*SINSEC*.9996D-02)
P4=D*(POR+2.0D00*TANSQ)/(VAL(11)*PCUBE*SINSEC*COSD)
P5=D*(5.0D00+TANSQ*(28.0D00+24.0D00*TANSQ))/(VAL(12)*
  COSD*PFIVE*SINSEC)
GLAT=DEG-P1*Q(2)+P2*Q(4)
TEMPL=P3*Q1-P4*Q(3)+P5*Q(5)
DLONG=TEMPL+7.0D00
CALL DECDEG(DLONG, IDLO, MLO, SLO)
IDLO=IDLO+140
CALL DECDEG(GLAT, IDLA, MLA, SLA)
GOTO 18
16 CONTINUE
WRITE(5,100)
100 FORMAT(' ***** GEOGRAPHICAL ERROR *****')
STOP 9998
18 CONTINUE
ANSWER(1)=IDLA
ANSWER(2)=MLA
ANSWER(3)=SLA
ANSWER(4)=IDLO
ANSWER(5)=MLO
ANSWER(6)=SLO
C STORE LAT AND LONG READY TO RETURN
RETURN
END
SUBROUTINE DECDEG(ANGLE, IDEG, MIN, SEC)
DOUBLE PRECISION ANGLE, SEC
INTEGER*2 IDEG, MIN
DOUBLE PRECISION DEGI, RMIN
IDEG=IFIX(SNGL(ANGLE))
DEGI=IDEG
ANGLE=60.0D00*(ANGLE-DEGI)
MIN=IFIX(SNGL(ANGLE))
RMIN=MIN
SEC=60.0D00*(ANGLE-RMIN)
RETURN
END

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