GEOMAS

DECUS Program Library Write-up

DECUS NO. 8-638

ABSTRACT

The program GEOMAS developed for the SEAMAP program of the University of Puerto Rico, calculates

(i) Great circle distance between two oceanographic stations

(ii) The mean latitude between the stations

(iii) The coriolis parameter for the mean latitude

(iv) Geostrophic velocities relative to a depth chosen by the operator or to the greatest depth common to both stations

(v) Geostrophic volume transports between given depths (by trapezoidal interpolation) and the total transport between the surface and the reference depth.

A description of the format and manner in which the input depths and dynamic heights are entered, is contained on comment cards in the program.

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C
C       THIS PROGRAM CALCULATES GEOSTROPHIC VELOCITIES AND VOLUME
C       TRANSPORTS BETWEEN TWO STATIONS. INPUT IS FIRSTLY THE
C       DEPTHS FOR WHICH THE VELOCITIES ARE TO BE CALCULATED,AND
C       BETWEEN WHICH THE VOLUME TRANSPORTS WILL BE FOUND TRAPEZ-
C       OIDALLY. TO SIGNAL THAT ALL THE DEPTHS HAVE BEEN READ IN,
C       TYPE '-133' .THE NEXT DATA REQUIRED ARE THE STATION NUMBER OF
C       THE FIRST STATION AS A4, WITH THE LATITUDE AND LONGITUDE
C       IN DECIMAL FORM AS 2F4.2 .THEN FEED IN UP TO 30 DYNAMIC
C       HEIGHTS IN DYNAMIC METERS , CORRESPONDING TO CHOSEN DEPTHS.
C       SIGNAL THAT ALL DYNAMIC HEIGHTS ARE IN BY TYPING '9999' .
C       SAME THING FOR THE SECOND STATION. THE PROGRAM WILL CHOOSE
C       THE GREATEST COMMON DEPTH AS THE REFERENCE LEVEL FOR THE
C       GEOSTROPHIC CALCULATION.
C       AFTER DOING THE CALCULATION AND PRINTING OUT, THE PROGRAM WILL
C       WAIT FOR MORE DATA AT THE ENTRY POINT OF STATION NAME,LATITUDE
C       AND LONGITUDE OF THE FIRST OF THE STATION PAIRS. IF THERE IS
C       NO MORE DATA , TYPE 'EXIT-1' AND THE RETURN KEY. THIS WILL
C        TERMINATE THE PROGRAM.
C
      DIMENSION Z(30),DIF(30),D1(30),D2(30),V(30),VEL(30)
      DO 613 K=2,30
      READ (1,223) Z(K)
      IF(Z(K)) 99,100,613
613   CONTINUE
99    DO 612 K=1,30
      DIF(K)=0.
      VEL(K)=0.
      D1(K)=0.
      D2(K)=0.
      V(K) = 0.
612   CONTINUE
223   FORMAT(F4.0)
C          DEPTHS NOW READ IN. STARTING TO READ FIRST STATION.
C
      READ (1,1) STA1,XA,YA
      IF(XA) 100,224,224
224   DO 26 N=2,30
      READ (1,20) D1(N)
      IF(D1(N)) 27,27,26
26    CONTINUE
27    READ (1,1) STA2,XB,YB
      DO 28 N=2,30
      READ (1,20) D2(N)
      IF(D2(N)) 345,345,28
1     FORMAT(A4,2F4.2)
20    FORMAT(F4.3)
28      CONTINUE
C
345   Z(1)=0.
333   KK=N-1
```

```
C
C       CALCULATING GREAT CIRCLE DISTANCE
        AK=.0174533
        FLAT1=XA*AK
        FLAT2=XB*AK
        FLON1=YA*AK
        FLON2=YB*AK
        DL=FLON1-FLON2
        AB=1.570884-FLAT2
        BA=1.570884-FLAT1
        C=COS(AB)*COS(BA)+SIN(AB)*SIN(BA)*COS(DL)
C         THIS COMPILER DOES NOT HAVE THE FUNCTION 'ARCCOSINE'.
C         I AM THEREFOR USIN 'SIN SQ = 1-COS SQ' , AND TAN = SIN/COS
C
        S=1.-(C*C)
        S=SQRT(S)
        T=S/C
        F=ATAN(T)*57.2958*110.5
        WRITE (1,103) STA1,STA2,F
103     FORMAT(////1X,'DISTANCE BETWEEN ',A4,' AND ',A4,
       15X,F7.2,2X,'KILOMETERS'/)
C                       CALCULATING CORIOLIS PARAMETER
        PHI=(XA+XB)/2.
        PHL=PHI*0.0174533
        PAR=1./(14.584*SIN(PHL))
C                   CALCULATING DYNAMIC HEIGHT DIFFERENCES
C          AND DETERMINING THE DEEPEST COMMON DEPTH
        DO 3 N=2,30
        IMP=K-N-1
        IF(IMP) 346,346,348
348     DIF(N)=D1(N)-D2(N)
C                         SWITCHING
        IF(D2(N)) 100,77,102
102     IF(D1(N)) 100,78,3
  3     CONTINUE
C
C        PRINTING OUT THE MEAN LATITUDE AND THE DEEPEST COMMON DEPTH
C
        WRITE (1,22) PHI,Z(N)
  22    FORMAT(25X,'MEAN LATITUDE = ',F6.2//1X,'BOTH STATIONS',
       1'GO TO ',F5.0,'  METERS')
        GO TO 80
77      WRITE (1,4) PHI,STA2,Z(N-1)
   4    FORMAT(25X,'MEAN LATITUDE = ',F6.2//1X,'MAXIMUM DEPTH IS AT'
       1' STATION ',A4,'  AND IS ',F5.0,' METERS'/)
        GO TO 79
78      WRITE (1,4) PHI,STA1,Z(N-1)
79      WRITE (1,5) STA1,STA2,DIF(N-1),Z(N-1)
5       FORMAT(1X,'DYNAMIC HEIGHT DIFFERENCE BETWEEN STATION ',A4,/
       1' AND STA. ',A4,' IS ',F7.3,' DYNAMIC METERS AT ',F5.0,'METERS'/)
```

```
C
C                CALCULATING THE GEOSTROPHICS
   6    I=N-1
        Z(1)=0.
        V(1) =0.
        DO 7 M=2,I
        QDIF=DIF(I)-(DIF(M)+DIF(M-1))/2.
        V(M)=V(M-1)+PAR*(Z(M)-Z(M-1))*QDIF
     7  CONTINUE
        DO 1001 K=1,I
        VEL(K)=(DIF(I)-DIF(K))*PAR*1.E5/F
  1001  CONTINUE
        WRITE (1,8)
     8  FORMAT(1H,'    DEPTH       VOLUME TRANSPORT       ',
       1'VELOCITY      VOLUME TRANSPORT'/6X,'Z'11X,'ABOVE Z',
       214X,'AT Z',11X,'Z2-Z1')
C
C
        WRITE (1,9) Z(1),V(1),VEL(1)
     9  FORMAT(1H,F8.0,3X,F11.2,13X,F6.1)
        DO 10  N=2,I
        A=V(N)-V(N-1)
        WRITE (1,50) A
        WRITE (1,9) Z(N),V(N),VEL(N)
    10  CONTINUE
        WRITE(1,401)
   401  FORMAT(//3X,'METERS',6X,'MEGATONS/SEC',10X,'CM/SEC',
       19X,'MEGATONS/SEC')
        GOTO99)
C
 84     WRITE(1,5) STA1,STA2,DIF(N),Z(N)
  5     FORMAT(55X,F6.2)
    16  I=N
        Z(1)=0.
        V(1)=0.
        DO 17 M=2,I
        QDFF=DIF(I)-(DIF(M)+DIF(M-1))/2.
        V(M)=V(M-1)+PAR*(Z(M)-Z(M-1))*QDFF
    17  CONTINUE
        DO 1002 K=1,I
        VEL(K)=(DIF(I)-DIF(K))*PAR*1.E5/F
  1002  CONTINUE
        WRITE (1,3)
        WRITE (1,9) Z(1),V(1),VEL(1)
        DO 101 K=2,I
        A=V(K)-V(K-1)
        WRITE (1,50) A
        WRITE (1,9) Z(K),V(K),VEL(K)
   101  CONTINUE
        GO TO 99
   346  WRITE(1,347)
   347  FORMAT(//////////'YOU MADE A MISTAKE OF SOME SORT',////)
   104  STOP
        END
```

OUTPUT

```
 R FORT
*,, <MAS.FT/G

ØØ5Ø
Ø1ØØ
Ø15Ø
Ø2ØØ          Reading in depth data
Ø25Ø
Ø3ØØ
Ø35Ø
Ø4ØØ
Ø45Ø
Ø5ØØ
-123          Signal that all depths are in

              READING IN FIRST STATION

Ⓐ
262117676698  Reading in station number, latitude and longitude
Ø288
Ø499
Ø652
Ø767
Ø861
Ø945          Reading in dynamic heights
1Ø23
1Ø96
1164
1228

ØØØØ          Signal that all dynamic heights are in

              READING IN SECOND STATION

26291133670Ø  Reading in station number, latitude and longitude
Ø224
Ø369
Ø466
Ø543
Ø6Ø3          Reading dynamic heights
Ø657
Ø712
Ø764

ØØØØ          Signal to start work
```

OUTPUT

DISTANCE BETWEEN 2621 AND 2629 7ØØ.57 KILOMETERS

MEAN LATITUDE = 14.5Ø

MAXIMUM DEPTH IS AT STATION 2629 AND IS 4ØØ. METERS

DYNAMIC HEIGHT DIFFERENCE BETWEEN STATION 2621
AND STA. 2629 IS Ø.332 DYNAMIC METERS AT 4ØØ. METERS

DEPTH Z	VOLUME TRANSPORT ABOVE Z	VELOCITY AT Z	VOLUME TRANSPORT Z2-Z1
Ø.	Ø.ØØ	13.Ø	
5Ø.	4.11	1Ø.5	4.11
1ØØ.	7.33	7.9	3.22
15Ø.	9.71	5.7	2.38
2ØØ.	11.45	4.2	1.74
25Ø.	12.69	2.9	1.25
3ØØ.	13.5Ø	1.7	Ø.81
35Ø.	13.95	Ø.8	Ø.45
4ØØ.	14.Ø9	Ø.Ø	Ø.14
METERS	MEGATONS/SEC	CM/SEC	MAGATONS/SEC

Now either return to Ⓐ to process more work, or type

EXIT-1

to terminate.

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PROGRAM LIBRARY

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