

## APPENDIX I

A computer programme for calculation of average velocity, path length and transit times of a ray traced through different layers of a multilayered Earth. (Scheme of calculation in Appendix III A and B)

/FORTRAN ERTRACE, MAP

```

PROGRAM TEST
C      CALCULATION OF ELEMENTS OF TRAVEL TIME MATRIX FOR
      IR.SARMA
C      NB=STN.,NAME, DEL=DELTA, OT=TRAVEL TIME, D=DEPTH
      DIMENSION SB(30), D(30), OT(30), V(30), DEL(30)
      DIMENSION THETE(30), TH(30), ALN(30), TN(30)
      READ (7,1) N
1      FORMAT (I2)
      READ (7,2) (SB(I), I=1,N)
      READ (7,4) (OT(I), I=1,N)
      READ (7,4) (D(I), I=1,N)
      READ (7,4) (DEL(I),I=1,N)
2      FORMAT (20A4)
4      FORMAT (10F8.2)
      DO 10 I=1,N
      WRITE (8,9) I
9      FORMAT ( 2X,(85('='))/5X,'STATION NO.',I4//T6,'STN'
1      , T20,'DELTA',T35,'DEPTH',T52,'A',T67,'AN',T80,
1      'TIME'//)
      ARG = DEL(I)* 3.14159/360.0
      FACT = 6371.0 * (1. - COS(ARG))
      A = ((6371.0 - D(I))*FACT*2.+D(I)*D(I))/(D(I))-FACT
      R = /L.
      L = 1 + 6371.0 - D(I)

```

```

A = A/2.
AN = A + 6371.0 - D(I)
ANN = A*A + AN*AN
ATN = A*AN*2.
WRITE (8,100) SB(I), DEL(I),D(I),A,AN,OT(I)
100  FORMAT (5X,A4,2F15.2,2E15.6,F15.2)
      WRITE (8,101)
101  FORMAT (/T6,'LAYER NO.',T20,'THETA DIFF',T40,'LAYER
1LENGTH',T61,'TIME',T82,'LAYER VEL. ')
      IF (I-1) 97,98,99
98   THETA(I) = ACOS((ANN-6371.*6371.)/ATN)*57.295780
      T = OT(I)
      AAL = 2.*3.14159*A*THETA(I)/180.0
      V(I) = AAL/E
      GO TO 700
99   NN = I
      VR = 6371.0 * 6371.0
      DO 50 J=1,NN
      IF (J.EQ.1) GO TO 50
      VR = (6371.0 - D(J-1))*2
50   THETA(J) = ACOS((ANN - VR)/ATN)*57.295780
      AAL = 2. * 3.14159 *A*THETA(NN)/180.
      WRITE(8,105) THETA(NN),AAL
105  FORMAT (/90X,'THETA =',F10.6/90X,'NTH LAYER LENGTH=',
1F12.6,'KM')
      TT = 0.0
      N1 = NN-1
      DO 150 II = 1,N1
      IK = II + 1
      TH(II) = THETA(II) - THETA(IK)
      ALN(II) = 2.*3.14159*A*TH(II)/180.0
      TN(II) = ALN(II)/V(II)

```

```
TT = TT + TN(II)
WRITE (8,15) II,TH(II),ALN(II),TN(II)
15  FORMAT (I9,4F20.6)
150 CONTINUE
T = OT(I) - TT
V(I) = AAL/T
700 WRITE (8,15) I, THETA(I),AAL,T,V(I)
10  CONTINUE
97  STOP
END
```

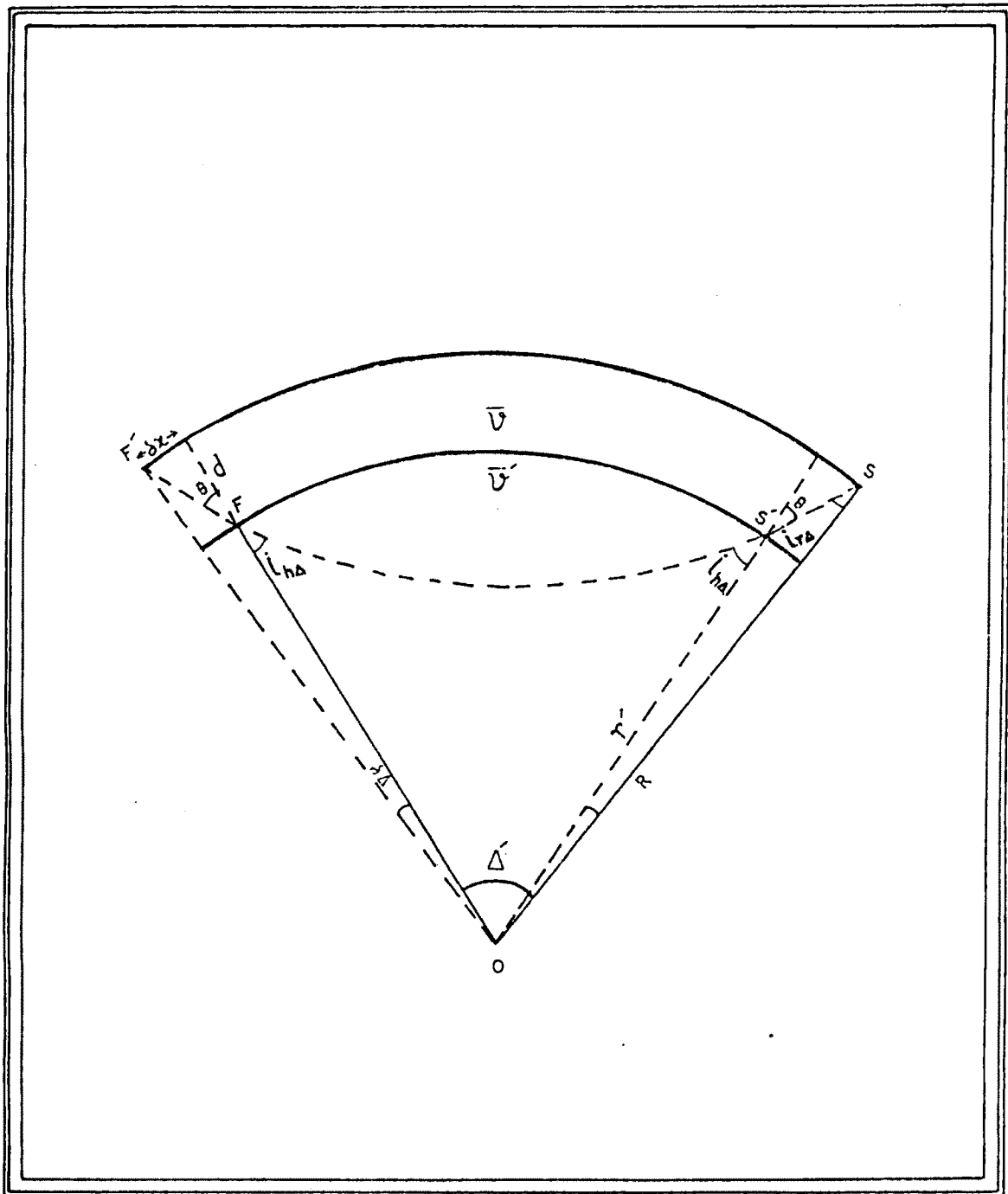


FIGURE A1 : Focal depth correction and determination of travel time and epicentral distance.