

4. Software (zdrojový program Fortran)

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$DEBUG
$NOTRUNCATE
PROGRAM FOURIER
C FILENAME FOUR.FOR
LOGICAL FOUR,SEP,APIC,ADEQ,SIM,NEXT
INTEGER R,RR,CAT,NUM,N,JJ
REAL MQ,ISE,MAXI,K1,IA,IB,RDT,X1,T1
DIMENSION A(300),B(300),IA(300),IB(300),OA(300),OB(300)
DIMENSION ALPHA(300),BETA(300)
DIMENSION G(900),X(900),T(900),Y(900),YC(900),BF(900)
C DIMENSION E(900),EC(900)
DIMENSION CNAME(20)
CHARACTER*12 NDFILE
CHARACTER*8 FNAME$
C
OPEN(UNIT=5,FILE='qsp1_f.dta',STATUS='OLD')
OPEN(UNIT=7,FILE='qsp1_f.out',STATUS='UNKNOWN')
OPEN(UNIT=1,FILE='NDFILE',STATUS='UNKNOWN')
500 FORMAT(20A4)
501 FORMAT(2I4)
502 FORMAT(6L1)
503 FORMAT(4F10.7)
504 FORMAT(3F8.3)
505 FORMAT(10F8.3)
506 FORMAT(F8.3)
600 FORMAT(1X,20A4)
601 FORMAT(1X,'THE FOURIER SERIES MODEL'/1X,44(1H*
* )/1X,'DEPARTMENT OF LAND USE AND IMPROVEMENT,'/1X,
* 'FACULTY OF ENVIRONMENTAL SCIENCES, CULS PRAGUE'/)
605 FORMAT(1X,17HCATCHMENT NUMBER:,I3/1X,17HCASE NUMBER : ,I3/
* 1X,15HDECISION TESTS:/1X,15(1H-)/
* 1X,7HFOUR = ,L1,2X,6HSEP = ,L1,2X,7HAPIC = ,L1,2X,7HADEQ =
* ,L1,2X,6HSIM = ,L1,2X,7HNEXT = ,L1)
611 FORMAT(1X,38HTIME INTERVAL DURATION - RDT (HOURS) :,F7.2/
* 1X, 38HNUMBER OF RUNOFF INTERVALS - JJ : ,I4/
* 1X, 41HNUMBER OF HARMONIC COEFFICIENTS - RR : ,I4/
* 1X, 38HCATCHMENT AREA - AREA (KM SQ.) : ,F7.2/)
632 FORMAT(1X,21HHARMONIC COEFFICIENTS/1X,18(1H-)/
* 3X,1HR,28X,2HIA,30X,2HIB/1X,70(1H-))
672 FORMAT(1X,21HHARMONIC COEFFICIENTS/1X,18(1H-)/
* 3X,1HR,28X,2HOA,30X,2HOB/1X,70(1H-))
673 FORMAT(1X,21HHARMONIC COEFFICIENTS/1X,18(1H-)/
* 3X,1HR,27X,5HALPHA,25X,4HBETA/1X,70(1H-))
633 FORMAT(1X, 70(1H-)/)
635 FORMAT(1X,I3,26X,F6.3,26X,F6.3)
640 FORMAT(1X,44HHARMONIC COEFFICIENT CALCULATION IS FINISHED/
* 1X, 32HGRAPH SIMULATION IS NOT REQUIRED)
642 FORMAT(1X,21HSYSTEM IDENTIFICATION/
* 1X, 26HFOURIER GRAPH COMPUTATION/1X,31(1H-))
645 FORMAT(1X,53HEVAPOTRANSPIR. CONSTANT FOR REAL TIME INTERVAL RDT =
* ,F7.3,11H (HOURS) : )
646 FORMAT(1X,1H+,70X,F8.3)
647 FORMAT(1X,1H+,70X,19H WAS NOT CALCULATED)
648 FORMAT(/1X,15HGODNESS OF FIT/
* 1X,40HEFFICIENCY COEFFICIENT BY NASH EC(-) = ,F7.3/
* 1X,32HINTEGRAL SQUARE ERROR ISE(-) = ,F7.3/
* 1X, 50(1H-))
650 FORMAT( 1X,29HTHE HYDROGRAPH RECONSTRUCTION/1X,29(1H-)/
* 1X,22HNUMBER OF HYDROGRAPH :,I4/)
654 FORMAT(1X,'TIME OBS.RUN COM.RUN'/
*1X,'T(HR) Q(L/DT) QC(L/DT)'/1X,50(1H-)/)
657 FORMAT(2X,F7.3,4X,F6.3,6X,F6.3)
C 658 FORMAT(1H+,5X,F7.3,7X,F7.3,20X,F7.3,3X,F7.3)
C 659 FORMAT(1H+,5X,F7.3,7X,F7.3,20X,F7.3,3X,1H-)
C 660 FORMAT(1H+,5X,F7.3,7X,F7.3,20X,1H-,3X,F7.3)
C 661 FORMAT(1H+,5X,F7.3,7X,F7.3,20X,1H-,3X,1H-)
C 662 FORMAT(1H+,5X,1H-,7X,1H-,20X,F7.3,5X,F7.3)
C 663 FORMAT(1H+,5X,1H-,7X,1H-,20X,F7.3,5X,1H-)
C 664 FORMAT(1H+,5X,1H-,7X,1H-,20X,1H-,5X,F7.3)
C 665 FORMAT(1H+,5X,1H-,7X,1H-,20X,1H-,5X,1H-)
C 666 FORMAT(1X/1X,'IF JJJ LE JJ THEN FOR EXTRAPOLATION EQ. Q(J)=KQ*EXP
C *(-BFC*J), BFC=',F6.4/)
C 667 FORMAT(1X,'SIMULATION OF SCENARIO/DESIGN DISCHARGES')
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668 FORMAT(1X,30(1H-))
669 FORMAT(5X,'T(I)',7X,'X(I)'/1X,20(1H-)/)
670 FORMAT(2X,F7.3,7X,F7.3)
C BEGINNING OF COMPUTATION
100 WRITE(6,601)
    WRITE(7,601)
    READ(5,500)CNAME
    WRITE(6,600)CNAME
    WRITE(7,600)CNAME
    READ(5,501)CAT,NUM
    READ(5,503)T1,X1,AL,BL
    READ(5,502)FOUR,SEP,APIC,ADEQ,SIM,NEXT
    WRITE(6,605)CAT,NUM,FOUR,SEP,APIC,ADEQ,SIM,NEXT
    WRITE(7,605)CAT,NUM,FOUR,SEP,APIC,ADEQ,SIM,NEXT
    CALL LEGEND
c Logical variables used for simulation:
c FOUR=T, SEP=F, APIC=F, ADEQ=F(F), SIM=F, NEXT=T(F)
    READ(5,501)RR,JJ
    READ(5,505)RDT,AREA
    WRITE(6,611)RDT,JJ,RR,AREA
    WRITE(7,611)RDT,JJ,RR,AREA
    RII=FLOAT(JJ-1)
C READING DISCHARGES
    READ(5,505)(Y(J),J=1,JJ)
    IF(.NOT.ADEQ) GOTO 8
    DO 7 J=1,JJ
7 Y(J)=(3.6*RDT*Y(J))/AREA
8 CONTINUE
    T(1)=T1
    DO 50 I=2,JJ
50 T(I)=T(I-1)+RDT
    X(1)=X1
    DO 51 I=2,JJ
    X(I)=BL+(AL*T(I))
51 CONTINUE
C Kontrolni tisk T(I) a X(I)
    WRITE(6,669)
    WRITE(7,669)
    DO 52 I=1,JJ
    WRITE(6,670)T(I),X(I)
    WRITE(7,670)T(I),X(I)
52 CONTINUE
    WRITE(6,632)
    WRITE(7,632)
    DO 53 I=1,JJ
53 G(I)=X(I)
    CALL FCOEF(RR,RII,A,B,G)
    DO 54 R=1,RR
    IA(R)=A(R)
    IB(R)=B(R)
    N=R-1
    WRITE(6,635)N,IA(R),IB(R)
    WRITE(7,635)N,IA(R),IB(R)
54 CONTINUE
    WRITE(6,672)
    WRITE(7,672)
    DO 22 I=1,JJ
22 G(I)=Y(I)
    CALL FCOEF(RR,RII,A,B,G)
    DO 23 R=1,RR
    OA(R)=A(R)
    OB(R)=B(R)
    N=R-1
    WRITE(6,635)N,OA(R),OB(R)
    WRITE(7,635)N,OA(R),OB(R)
23 CONTINUE
    WRITE(6,673)
    WRITE(7,673)
    DO 26 R=1,RR
    ALPHA(R)=2.*(IA(R)*OA(R)+IB(R)*OB(R))/(IA(R)*IA(R)+IB(R)*IB(R))/
    *RII
    BETA(R)=2.*(IA(R)*OB(R)-IB(R)*OA(R))/(IA(R)*IA(R)+IB(R)*IB(R))/RII
26 CONTINUE
    ALPHA(1)=ALPHA(1)/2.
    WRITE(6,633)
    WRITE(7,633)
    DO 24 I=1,JJ

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24 BF(I)=0.
DO 27 R=1,RR
N=R-1
WRITE(6,635)N,ALPHA(R),BETA(R)
WRITE(7,635)N,ALPHA(R),BETA(R)
27 CONTINUE
WRITE(6,633)
WRITE(7,633)
DO 31 I=1,JJ
RI=FLOAT(I-1)
DO 30 R=2,RR
RER=FLOAT(R-1)
ARG=(6.28318531/RII)*RI*RER
BF(I)=BF(I)+ALPHA(R)*COS(ARG)+BETA(R)*SIN(ARG)
30 CONTINUE
BF(I)=BF(I)+ALPHA(1)
31 CONTINUE
WRITE(6,642)
WRITE(7,642)
DO 32 I=1,JJ
32 G(I)=X(I)
CALL FCOEF(RR,RII,A,B,G)
DO 33 R=1,RR
OA(R)=RII*(ALPHA(R)*A(R)-BETA(R)*B(R))/2.
OB(R)=RII*(A(R)*BETA(R)+B(R)*ALPHA(R))/2.
33 CONTINUE
DO 34 I=2,JJ
34 YC(I)=0.
OA(1)=2.*OA(1)
DO 36 I=1,JJ
RI=FLOAT(I-1)
DO 35 R=2,RR
RER=FLOAT(R-1)
ARG=(6.28318531/RII)*RI*RER
YC(I)=YC(I)+OA(R)*COS(ARG)+OB(R)*SIN(ARG)
35 CONTINUE
YC(I)=YC(I)+OA(1)
36 CONTINUE
IF(.NOT.SIM)THEN
MQ=0.
SQ2=0.
SQM2=0.
DO 37 I=1,JJ
37 MQ=MQ+Y(I)
MQ=MQ/FLOAT(JJ)
DO 38 I=1,JJ
SQ2=SQ2+(Y(I)-YC(I))**2
SQM2=SQM2+(Y(I)-MQ)**2
38 CONTINUE
EC=SQ2/SQM2
K1=SQRT(SQ2)
EC=(1.0-EC)
ISE=K1/MQ
MAXI=0.
DO 39 I=1,JJ
39 MAXI=AMAX1(MAXI,Y(I))
SUM=0.
K1=0.
DO 40 I=1,JJ
K1=YC(I)-Y(I)
K1=ABS(K1)
K1=K1*Y(I)
SUM=SUM+K1
40 CONTINUE
DEV=SUM*200.
K1=FLOAT(JJ)*(MAXI**2)
DEV=DEV/K1
WRITE(6,648)EC,ISE
WRITE(7,648)EC,ISE
ELSE
ENDIF
WRITE(6,650)NUM
WRITE(7,650)NUM
WRITE(6,654)
WRITE(7,654)
DO 42 I=1,JJ
WRITE(6,657)T(I),Y(I),YC(I)

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        WRITE(7,657)T(I),Y(I),YC(I)
42 CONTINUE
C      print on specified file (cname)
C      SCREEN CONTROL
      read '(A12)',ndfile
C      data pro pripravu grafu
      write(*,'(A\)' )' Nazev povodi nebo datoveho souboru:'
      read(*,'(A\)' )fname$
      open(unit=8,file=fname$)
      write(8,'(2x,i3,2f8.3)' )(i,y(i),yc(i),i=1,jj)
      close(8)
      IF(NEXT)GOTO 100
44 STOP
      END
      SUBROUTINE LEGEND
C
601 FORMAT(1X,'LEGEND TO THE DECISION TESTS:'/1X,28(1H-)/
      *1X,'IF FOUR FALSE - ONLY HARMONIC COEFFICIENTS ARE CALCULATED'/
      *1X,'IF FOUR TRUE - WHOLE PROGRAM IS EXECUTED'/
      *1X,'IF SIM TRUE - ONLY SIMULATION IS PERFORMED'/
      *1X,'IF SEP TRUE - SEPARATION OF BASE FLOW+NET RAINFALL'/
      *1X,'IF ADEQ TRUE - RUNOFF WILL BE TRANSFERED TO MM/RDT'/
      *1X,'IF APIC TRUE - ANTECEDENT PRECIPITATION INDEX IS CALCULATED'/
      *1X,'IF NEXT TRUE - NEXT ANALYSIS IS PERFORMED'/)
602 FORMAT(1X,'NOTE: IF SIMULATION THEN SIM=T,SEP=F,ADEQ=F,FOUR=T')
      WRITE(6,601)
      WRITE(7,601)
      WRITE(6,602)
      WRITE(7,602)
      RETURN
      END
      SUBROUTINE FCOEF(RR,RII,A,B,G)
      INTEGER R,RR
      REAL RI,RII
      DIMENSION A(900),B(900),G(900)
      JII=IFIX(RII)-1
      DO 1 R=1,RR
      A(R)=2.*G(1)/RII
      B(R)=0.
      RER=FLOAT(R-1)
      DO 1 I=2,JII
      RI=FLOAT(I-1)
      ARG=RER*RI/RII
      ARG=ARG*6.28318531
      A(R)=A(R)+2.*G(I)*COS(ARG)/RII
      B(R)=B(R)+2.*G(I)*SIN(ARG)/RII
1 CONTINUE
      A(1)=A(1)/2.
      B(1)=0.
      RETURN
      END

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