Smoothed Spectra by Spectral Window—SWIN

The program SWIN (Smoothed Spectra by Parzen's Spectral Window) is a subroutine subprogram that performs smoothing on a spectrum that has already been computed in the frequency domain. Therefore, unlike the other program LWIN, the length of the spectrum to be treated, i.e., the number of spectral values, is arbitrary, and there are no restrictions related to powers of 2.

SWIN (Smoothed Spectra by Spectral Window)

[Purpose]

To smooth the given Fourier and power spectra in the frequency domain using Parzen's spectral window with the specified bandwidth.

[Usage]

(1) How to connect

CALL SWIN (NFOLD, F, G, ND, IND, DF, BAND)

Argument	Туре	Parameter in calling program	Return Parameter
NFOLD	Ι	Total number of Fourier & Power Spectra	Unchanged
F	R 1-D array (ND)	Original Unsmoothed Fourier Spectrum if IND=010, no need to input here	Smoothed Fourier Spectrum
G	R 1-D array (ND)	Original Unsmoothed Power Spectrum if IND=010, no need to input here	Smoothed Power Spectrum
ND	Ι	Dimension size of F and G in calling program	Unchanged
IND	Ι	Index for given original spectra 100 : Fourier spectrum 010 : Power spectrum	Unchanged
DF	R	Frequency interval of Fourier & Power Spectra (Unit : Hz)	Unchanged
BAND	R	Band width (unit: Hz)	Unchanged

(2) Necessary subroutines and function subprograms

- (3) Remarks
 - i) The arguments *IND* can be added together. Therefore, given both the original Fourier spectrum and the power spectrum, we can write IND = 110 (100 + 010). However, the result is the same with IND = 010.
 - ii) BAND /DF must be greater than 560/ 151 and less than the lesser of 14000/ 151 and 140(NFOLD-1)/151.
 - iii) If the argument BAND = 0.0 then no smoothing is performed.

[Calculation Method]

First, create a Parzen's spectral window according to the specified bandwidth as follows.

$$W(f) = \frac{3}{4}u \left(\frac{\sin\frac{\pi uf}{2}}{\frac{\pi uf}{2}}\right)^4$$

Next, we perform a moving average of the power spectrum numerically.

$$\overline{G}(f) = \int_{-\infty}^{\infty} G(g) W(f-g) \mathrm{d}g$$

The width of the window is truncated at $\pm f = 2/u$ on the horizontal axis.

There are some restrictions on the bandwidth for smoothing that can be specified as arguments, as noted in the notes above. These are to prevent the window from being too wide compared to the length of the given spectrum, and for programming reasons, the shape of the window should be expressed as a number within 101. However, none of these restrictions are of any practical concern. If the bandwidth is specified as zero, the program returns to the calling program without smoothing.

When a window is applied to the spectrum, the width of the window will be out of the spectrum at both ends of the spectrum. In such a case, the values in the outliers are folded back into the spectrum by using the bending relation of the spectrum.

When the Fourier spectrum is given first, it is smoothed by converting it to a power spectrum, and finally the smoothed Fourier spectrum is obtained from the smoothed power spectrum. In this way, the smoothing is not done directly on the Fourier spectrum, but on the power spectrum, in order not to change the power of the original waveform.

[Program List]

С	* * * * * * * * * * * * * * * * * * * *	SWIN	1
С	SUBROUTINE FOR SMOOTHED SPECTRA BY PARZEN'S SPECTRAL WINDOW	SWIN	2
С	* * * * * * * * * * * * * * * * * * * *	SWIN	3
С		SWIN	4
С	CODED BY Y. OHSAKI	SWIN	5
С		SWIN	6
С	PURPOSE	SWIN	7
С	TO SMOOTH FOURIER AND POWER SPECTRA BY APPLICATION OF	SWIN	8
С	PARZEN'S SPECTRAL WINDOW WITH THE SPECIFIED BANDWIDTH	SWIN	9
С	IN FREQUENCY DOMAIN	SWIN	10
С		SWIN	11

C CALL SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 13 C DESCRIPTION OF ARGUMENTS SWIN 14 C DESCRIPTION OF ARGUMENTS SWIN 16 C PESCRIPTION OF ARGUMENTS SWIN 17 C NFOLD - TOTAL. NUMBER OF THE GIVEN SPECTRUM AT CALL/RETURN SWIN 18 C G(ND) - THE ORIGINAL/SMOOTHED POWER SPECTRUM AT CALL/RETURN SWIN 20 C G(ND) - THE ORIGINAL/SMOOTHED POWER SPECTRUM AT CALL/RETURN SWIN 20 C DIA - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 22 C REMARKS SWIN 23 SWIN 23 C REMARKS SWIN 24 SWIN 25 C REMARKS SWIN 26 SWIN 26 C NONE SWIN 26 SWIN 27 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 33 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN <t< th=""><th>С</th><th></th><th>USAGE</th><th>SWIN</th><th>12</th></t<>	С		USAGE	SWIN	12
C SWIN 14 C DECRIPTION OF ARGUMENTS SWIN 15 C NFOLD - TOTAL NUMBER OF THE GIVEN SPECTRUA AT CALL/RETURN SWIN 17 C G(ND) - THE ORIGINAL/SMOOTHED FOURIER SPECTRUM AT CALL/RETURN SWIN 18 C IND - THE ORIGINAL/SMOOTHED FOURIER SPECTRUM AT CALL/RETURN SWIN 20 C IND - THE ORIGINAL/SMOOTHED FOURIER SPECTRUM IS ORIGINALLY GIVEN SWIN 20 C DF - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 23 C BAND - THE SPECIFIED BANDHOTH IN HZ SWIN 23 C BAND - THE SPECIFIED BANDHOTH IN HZ SWIN 23 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 26 C NONE SWIN 26 SWIN 28 C NONE SWIN 26 SWIN 28 C NONE SWIN 28 SWIN 30 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 31 C NONE SWIN 31 32 DIMENSION F(ND), G(ND), W(101), G1 (4497), G2 (С		CALL SWIN (NFOLD, F, G, ND, IND, DF, BAND)	SWIN	13
C DESCRIPTION OF ARGUMENTS SWIN 15 C NFULD - TOTAL, NUMBER OF THE GIVEN SPECTRUM AT CALL/RETURN SWIN 17 C G (MD) - THE ORIGINAL/SMOOTHED FOURER SPECTRUM AT CALL/RETURN SWIN 18 C IND - THE ORIGINAL/SMOOTHED FOURER SPECTRUM AT CALL/RETURN SWIN 18 C IND - THE ORIGINAL/SMOOTHED FOURER SPECTRUM AT CALL/RETURN SWIN 21 C IND - THE ORIGINAL/SMOOTHED FOURER SPECTRUM IS ORIGINALLY GIVEN SWIN 21 C DIO WIEN POURER SPECTRUM IS ORIGINALLY GIVEN SWIN 22 C DAD - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 23 C REMARKS SWIN 24 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 27 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C INITIALIZATION SWIN 33 C INITIALIZATION SWIN 33 C INITIALIZATION SWIN	С			SWIN	14
C NFOLD - TOTAL NUMBER OF THE GIVEN SPECTRAL VALUES SWIN 16 C F(MD) - THE ORIGINAL/SMOOTHED POURIER SPECTRUM AT CALL/RETURN SWIN 17 C G(MD) - THE ORIGINAL/SMOOTHED POURIER SPECTRUM AT CALL/RETURN SWIN 19 C IND - 100 WHEN POURIER SPECTRUM IS ORIGINALLY GIVEN SWIN 20 C DF - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 21 C BAND - THE SPECIFIED BANDWIDTH IN HZ SWIN 23 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 25 C 140000/151 OR 140 (NPOLD-1)/151 WHICHEVER SMALLER SWIN 26 NONE SWIN 28 SWIN 28 C NONE SWIN 28 SWIN 28 C NONE SWIN 30 SWIN 31 C NONE SWIN 31 33 C SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 33 C INTIALIZATION SWIN 33 G INTIALIZATION	С		DESCRIPTION OF ARGUMENTS	SWIN	15
C F(ND) - THE ORIGINAL/SMOOTHED FOURIER SPECTRUM AT CALL/RETURN SWIN 17 C G(ND) - THE ORIGINAL/SMOOTHED FOURIER SPECTRUM AT CALL/RETURN SWIN 18 C IND - 100 WHEN FOURIER SPECTRUM IS ORIGINALLY GIVEN SWIN 20 O10 WHEN POWER SPECTRUM IS ORIGINALLY GIVEN SWIN 20 C DF - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 23 C BAND - THE SPECIFIED BANDWIDTH IN HZ SWIN 23 C REMARKS SWIN 24 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 26 C I4000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 27 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 28 C NONE SWIN 33 35 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 33 C INITIALIZATION SWIN 35 C INITIALIZATION SWIN 36 C INITIALIZATION SWIN 36 <td< td=""><td>С</td><td></td><td>NFOLD – TOTAL NUMBER OF THE GIVEN SPECTRAL VALUES</td><td>SWIN</td><td>16</td></td<>	С		NFOLD – TOTAL NUMBER OF THE GIVEN SPECTRAL VALUES	SWIN	16
C G(ND) - THE ORIGINAL/SMOOTHED POWER SPECTRUM AT CALL/RETURN SWIN 18 C IND - 100 WHEN FOURIER SPECTRUM IS ORIGINALLY GIVEN SWIN 20 C DF - FREQUENCY INCREMENT IN THE SPECTRUM IN LZ SWIN 21 C BAND - THE SPECIFIED BANDWIDTH IN HZ SWIN 23 C REMARKS SWIN 23 C REMARKS SWIN 23 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 25 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 26 SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 28 C NONE SWIN 31 C NONE SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 33 33 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 34 C INITIALIZATION SWIN 35 C SWIN 34 35 C <td>С</td> <td></td> <td>F(ND) - THE ORIGINAL/SMOOTHED FOURIER SPECTRUM AT CALL/RETURN</td> <td>SWIN</td> <td>17</td>	С		F(ND) - THE ORIGINAL/SMOOTHED FOURIER SPECTRUM AT CALL/RETURN	SWIN	17
C IND 100 WHEN POURER SPECTRUM IS ORIGINALLY GIVEN SWIN 19 C DF - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 20 C DF - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 21 C BAND - THE SPECIFIED BANDWIDTH IN HZ SWIN 23 C REMARKS SWIN 24 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 26 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 26 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 27 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 33 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C INITIALIZATION SWIN 36 C INITIALIZATION SWIN 37 IF (BAND, EQ. 0.) GO TO 120 SWIN 37 IF (CBAND, EQ. 0.) GO TO 240 SWIN 32 C SPECTRAL WINDOW SWIN 32 C <td>C</td> <td></td> <td>G(ND) - THE ORIGINAL/SMOOTHED POWER SPECTRUM AT CALL/RETURN</td> <td>SWIN</td> <td>18</td>	C		G(ND) - THE ORIGINAL/SMOOTHED POWER SPECTRUM AT CALL/RETURN	SWIN	18
C INS INS INS INS STIN 20 010 DF - FREQUENCY INCREMENT IN THE SPECTRUM IN HZ SWIN 21 C BAND - THE SPECIFIED BANDWIDTH IN HZ SWIN 22 C SUN 23 SWIN 22 C BAND - THE SPECIFIED BANDWIDTH IN HZ SWIN 22 C SUN 24 SWIN 22 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 26 C 14000/151 OR 140 (NPOLD-1)/151 WHICHEVER SMALLER SWIN 27 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 30 SUBROUTINES SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C SWIN 32 SWIN 33 C SWIN 33 34 SWIN 35 C SWIN 36 SWIN 38 UDF=1, S54305/BAND#DF SWIN 38 UDF=1, S54305/BAND#DF SWIN SWIN 44 SWIN </td <td>C</td> <td></td> <td>IND - 100 WHEN FOURIER SPECTRUM IS ORIGINALLY GIVEN</td> <td>SWIN</td> <td>19</td>	C		IND - 100 WHEN FOURIER SPECTRUM IS ORIGINALLY GIVEN	SWIN	19
C Difference Sector Sector<	C		010 WHEN POWER SPECTRUM IS ORIGINALLY GIVEN	SWIN	20
C DA THE SPECIFIED BANDWIDTH IN HZ SVIN 21 C BAD THE SPECIFIED BANDWIDTH IN HZ SVIN 23 C REMARKS SVIN 23 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SVIN 26 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SVIN 26 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SVIN 28 C NONE SVIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SVIN 31 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SVIN 33 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SVIN 33 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SVIN 33 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SVIN 33 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SVIN 33 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SVIN 33 C SUBROLTIALIZATION SVIN	C		DE - EREQUENCY INCREMENT IN THE SPECTRUM IN H7	SWIN	20
C DARD INE 31 ECLIFIED DARGEDITIENT IN THE SWIN 23 C SWIN 23 SWIN 23 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 26 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 26 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 29 C NONE SWIN 20 C NONE SWIN 20 C NONE SWIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 30 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 32 C SWIN 32 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 33 C SWIN 33 C SWIN 34 C SWIN 35 DIMENSION F (ND), G (ND 120 SWIN 36 T=1. /DF SWIN 37 IF (GR, G, 0.5) GO TO 120 SWIN 37 IF (GR, G, 0.5) GO TO 230 SWIN 40 LMAX_ETFIX(2. /UDF)+1 SWIN 41 <t< td=""><td>C</td><td></td><td>BAND - THE SDECIEIED RANDWIDTH IN H7</td><td>SWIN</td><td>21</td></t<>	C		BAND - THE SDECIEIED RANDWIDTH IN H7	SWIN	21
C REMARKS SWIN 24 C THE RATIO BAND/DF MUST BE LARGER THAN 560/151, AND LESS THAN SWIN 25 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 25 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 28 C NONE SWIN 29 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 32 DIMENSION F (ND), G (ND), W(101), G1 (4497), G2 (4497) SWIN 33 C SWIN 35 C SWIN 36 T=1. /DF SWIN 36 T=1. /DF SWIN 37 IF (BAND, EQ. 0.) GO TO 120 SWIN 38 UDF=1. 854305/BAND#0F SWIN 39 IF (UDF, GT, 0. 5) GO TO 240 SWIN 40 LMAX=IFIX (2. /UDF)+1 SWIN 41 IF (LMAX, GT, 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 44 <t< td=""><td>C</td><td></td><td>DAND THE STECTTED DANDWIDTH IN HZ</td><td>SWIN</td><td>22</td></t<>	C		DAND THE STECTTED DANDWIDTH IN HZ	SWIN	22
C NLMANKS SITE AND PUNCTION SUBPROGRAMS REQUIRED STAIN 25 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 25 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 25 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 29 C NONE SWIN 29 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 35 C JIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 45 W (1)=1, 5, 50, 50, 60, TO 120 SWIN 45 W (1)=1, 5, 50, 50, 60, TO 230 SWIN 45 C SWIN 45	C		DEMADKS	SWIN	20
C THE KALLO BARD/DP MOST BE LARGER THAN 500/151, AND LESS THAN SWIN 25 C 14000/151 OR 140 (NFOLD-1)/151 WHICHEVER SMALLER SWIN 26 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 29 C NONE SWIN 20 C SWIN 30 SUBROUTINES SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C SWIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C SWIN 32 SWIN 32 SWIN 33 C INITIALIZATION SWIN 34 SWIN 35 C SWIN 34 SWIN 35 SWIN 35 C SWIN 35 SWIN 36 SWIN 37 TIF (BAND, EQ. 0.) 60 TO 120 SWIN 37 SWIN 38 SWIN 38 UDF=1, 854305/BANDNDF SWIN 41 SWIN 41 SWIN 41 IF (UDF, GT. 0.5) GO TO 230 SWIN 41 SWIN 41 SWIN 42 C SPECTRAL WINDOW SWIN 45 SWIN 44 SWIN 45 <t< td=""><td>C</td><td></td><td>THE DATIO DAND/DE MUST DE LADCED THAN 560/151 AND LESS THAN</td><td>SWIN</td><td>24 25</td></t<>	C		THE DATIO DAND/DE MUST DE LADCED THAN 560/151 AND LESS THAN	SWIN	24 25
C 14000/151 OK 140 (NPOLD-1)/151 WHICHEVER SMALLER SWIN 25 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 27 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 34 C SWIN 35 C SWIN 36 T=1. /DF SWIN 37 IF (GAND.EQ. 0.) GO TO 120 SWIN 36 UDF=1.854305/BAND*DF SWIN 39 IF (UDF, GT. 0.5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF)+1 SWIN 41 IF (UDF, GT. 0.5) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 44 C OTT	C		THE RATIO DAND/DF MUST DE LARGER THAN 300/131, AND LESS THAN	SWIN	20 96
C SWIN 22 C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 28 C NONE SWIN 29 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 34 C INITIALIZATION SUBROUTINE SWIN (ACMON), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 32 T=1. /DF SWIN 32 T=1. /DF SWIN 33 C SWIN 35 C SWIN 35 C SWIN 35 T=1. /DF SWIN 37 IF (DF, GT. 0. 5 0 OT 0 230 SWIN 38 UDF=1.854305/BAND*DF SWIN 31 IF (LMAX, GT. 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 45 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 53 C	C		14000/151 OK 140(NFOLD-1)/151 WHICHEVER SMALLER	SWIN	20
C SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED SWIN 29 C SWIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 33 C SWIN 34 C INITIALIZATION SUBROUTINE SUBSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 34 C INITIALIZATION SWIN 32 SWIN 35 C SWIN 36 T=1. /DF SWIN 37 IF (BAND, EQ, 0.) GO TO 120 SWIN 38 UDF=1. 854305/BAND*DF SWIN 39 IF (UDF, GT, 0. 5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF)+1 SWIN 40 IF (LMAX, GT, 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 44 C SPECTRAL (L-1)*UDF SWIN 46 D 110 L=2, LMAX SWIN 47 D IF=1. 570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)* (SIN (DIF) /DIF)***4 SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 51 C	C			SWIN	21
C NARE SWIN 29 C SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 30 SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 32 DIMENSION F (ND), G (ND), W(101), G1 (4497), G2 (4497) SWIN 33 C SWIN 34 C INITIALIZATION SWIN 35 C SWIN 35 C SWIN 36 T=1. /DF SWIN 37 IF (BAND, EQ. 0.) GO TO 120 SWIN 38 UDF=1. 854305/BAND*DF SWIN 39 IF (UP, GT. 0.5) GO TO 230 SWIN 41 IF (LMAX, GT. 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 44 V(1)=0.75*UDF SWIN 44 54 M (1)=0.75*UDF SWIN 45 46 D0 110 L=2, LMAX SWIN 47 51 C CONTINUE SWIN 51 C CONTINUE SWIN 51 C	C		SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED	SWIN	28
C SWIN 30 SWIN 31 C SWIN 31 C SWIN 32 DIMENSION F(ND), G(ND), W(101), G1(4497), G2(4497) SWIN 33 C INITIALIZATION C SWIN 34 C INITIALIZATION C SWIN 34 C INITIALIZATION C SWIN 35 C SWIN 36 T=1. /DF SWIN 36 T=1. /DF SWIN 36 IF(BAND.EQ.0.) GO TO 120 SWIN 38 UDF=1.854305/BAND*DF SWIN 39 IF (UDF, GT. 0. 5) GO TO 230 SWIN 40 LMAX=IFIX(2. /UDF)+1 SWIN 41 IF (UAMA. GT. 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 44 C SPECTRAL SWIN 45 SWIN 46 D0 110 L=2, LMAX SWIN 46 SWIN 47 D110 CONTINUE SWIN 47 SWIN 48 W(L)=W(1)*(SIN(DIF)/DIF)***4 SWIN 47 SWIN 50 C C SWIN 53 C CONVERSION FROM FOURIER TO POWER SPECTRUM	C		NUNE	SWIN	29
SUBROUTINE SWIN (NFOLD, F, G, ND, IND, DF, BAND) SWIN 31 C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 32 C INITIALIZATION C INITIALIZATION SWIN 35 SWIN 35 C SWIN 36 T=1. /DF SWIN 37 IF (BAND, EQ. 0.) GO TO 120 SWIN 39 UDF=1. 854305/BAND*DF SWIN 39 IF (UDF, GT. 0.5) GO TO 230 SWIN 40 LMAX=IFIX(2. /UDF)+1 SWIN 41 IF (LMAX GT. 101) GO TO 240 SWIN 43 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 45 W (1)=0. 75*UDF SWIN 46 SWIN 46 D0 110 L=2, LMAX SWIN 47 SWIN 48 W (L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 46 SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 51 C SWIN 52 SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 56 G (NC)=2. *F (K) **2/T SWIN 57 130 CONTINUE SWIN 56 G (NFOLD)=I SWIN 56 G (NFOLD)=F (NFOLD) **2/T SWIN 56 <td>С</td> <td></td> <td></td> <td>SWIN</td> <td>30</td>	С			SWIN	30
C SWIN 32 DIMENSION F (ND), G (ND), W (101), G1 (4497), G2 (4497) SWIN 32 C INITIALIZATION SWIN 34 C INITIALIZATION SWIN 35 C INITIALIZATION SWIN 36 T=1. /DF SWIN 37 IF (BAND.EQ. 0.) GO TO 120 SWIN 37 IF (BAND.EQ. 0.) GO TO 120 SWIN 37 IF (DF.GT. 0.5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF) +1 SWIN 41 IF (LMAX, GT. 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 43 SWIN 43 C SPECTRAL WINDOW SWIN 44 SWIN 44 C SPECTRAL WINDOW SWIN 44 SWIN 44 C SPECTRAL WINDOW SWIN 44 SWIN 44 C SPECTRAL WINDOW SWIN 44 SWIN 45 C SVEN 46 SWIN 45 SWIN 45 M (1)=0. 75*UDF SWIN 45 SWIN 46 SWIN 45 C SUN 45 SWIN 46 SWIN 45 SWIN 45 C SUN 50 SWIN 51 SWIN 51 SWIN 52 C SWIN 52 SWIN 53 SWIN 55 SWIN 55 <			SUBROUTINE SWIN(NFOLD, F, G, ND, IND, DF, BAND)	SWIN	31
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	С			SWIN	32
C INITIALIZATION SWIN 35 C INITIALIZATION SWIN 36 T=1. /DF SWIN 37 IF (BAND. EQ. 0.) GO TO 120 SWIN 38 UDF=1. 854305/BAND*DF SWIN 39 IF (UDF, GT. 0. 5) GO TO 230 SWIN 40 LMAX=IFIX(2. /UDF)+1 SWIN 41 IF (LMAX, GT. 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 43 C SPECTRAL WINDOW SWIN 44 C SWIN 45 W(1)=0.75*UDF SWIN 46 DO 110 L=2, LMAX SWIN 45 SWIN 46 DO 110 L=2, LMAX SWIN 47 SWIN 48 (L)=W(1)*(SIN (DIF)/DIF)**4 SWIN 50 50 50 50 51 52 SWIN 53 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 54 53 53 52 51 56 56 56 56 (K)=2.*F (K)**2/T SWIN 56 56 (C)=2.*F (K)**2/T SWIN 57 50 <t< td=""><td></td><td></td><td>DIMENSION F(ND), G(ND), W(101), G1(4497), G2(4497)</td><td>SWIN</td><td>33</td></t<>			DIMENSION F(ND), G(ND), W(101), G1(4497), G2(4497)	SWIN	33
C INITIALIZATION SWIN 35 C SWIN 36 T=1. /DF SWIN 37 IF (BAND. EQ. 0.) GO TO 120 SWIN 38 UDF=1. 854305/BAND#DF SWIN 39 IF (UDF. GT. 0. 5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF) +1 SWIN 41 IF (LMAX. GT. 101) GO TO 240 SWIN 42 C SPECTRAL WINDOW SWIN 43 C SPECTRAL WINDOW SWIN 44 C SPECTRAL WINDOW SWIN 44 C SVEN 45 W(1)=0.75*UDF SWIN 46 DO 110 L=2, LMAX SWIN 47 DIF=1. 570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN (DIF) / DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 SWIN 53 C CONVERSION FROM FOULDIER TO POWER SPECTRUM SWIN 54 G(1)=F(1)**2/T SWIN 55 GO 130 K=2, NFOLD-1 SWIN 55 G(1)=SWIN 55 </td <td>С</td> <td></td> <td></td> <td>SWIN</td> <td>34</td>	С			SWIN	34
C SWIN 36 T=1. /DF SWIN 37 IF (BAND. EQ. 0.) GO TO 120 SWIN 39 UDF=1. 854305/BAND*DF SWIN 39 IF (UDF, GT. 0. 5) GO TO 230 SWIN 41 IF (LMAX. GT. 101) GO TO 240 SWIN 42 C SWIN 43 C SPECTRAL WINDOW C SWIN 43 C SPECTRAL WINDOW SWIN 45 SWIN 45 W(1)=0. 75*UDF SWIN 46 D0 110 L=2, LMAX SWIN 47 DIF=1. 570796*REAL (L-1)*UDF SWIN 46 W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM C SWIN 51 C CONVERSION FROM FOURIER TO POWER SPECTRUM G(1)=F(1)**2/T SWIN 55 D0 130 K=2, NFOLD-1 SWIN 55 G (K)=2. *F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F(NFOLD)*2/T SWIN 59 C SMOTHING OF POWER SPECTRUM SWIN 59 C SMOTHING OF POWER SPECTRUM SWIN 62 140 IF (BAND. EQ. 0.) GO	С		INITIALIZATION	SWIN	35
T=1. /DF SWIN 37 IF (BAND. EQ. 0.) GO TO 120 SWIN 38 UDF=1. 854305/BAND*DF SWIN 39 IF (UDF. GT. 0.5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF) +1 SWIN 41 IF (LMAX. GT. 101) GO TO 240 SWIN 42 C SWIN 42 C SPECTRAL WINDOW C SPECTRAL WINDOW C SPECTRAL WINDOW C SWIN 45 W(1)=0. 75*UDF SWIN 46 DO 110 L=2, LMAX SWIN 47 DIF=1. 570796*REAL (L-1) *UDF SWIN 47 DIF=1. 570796*REAL (L-1) *UDF SWIN 48 w(L)=w(1)*(SIN (DIF) /DIF)**4 SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 53 G(1)=F (1)**2/T SWIN 55 DO 130 K=2, NFOLD-1 SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD) **2/T SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD) **2/T SWIN 56 C SMOOTHING OF POWER SPECTRUM SWIN	С			SWIN	36
IF (BAND, EQ. 0.) GO TO 120 SWIN 38 UDF=1. 854305/BAND*DF SWIN 39 IF (UDF, GT. 0.5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF)+1 SWIN 41 IF (LMAX, GT. 101) GO TO 240 SWIN 42 C SWIN 43 C SPECTRAL WINDOW SWIN 44 C SWIN 45 W(1)=0.75*UDF SWIN 46 D0 110 L=2, LMAX SWIN 47 DIF=1.570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C SWIN 51 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN G (1)=F (1)**2/T SWIN 55 DO 130 K=2, NFOLD-1 SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD) **2/T SWIN 58 C SMOOTHING OF POWER SPECTRUM SWIN 58 C SMOOTHING OF POWER SPECTRUM SWIN 59 C SMOOTHING OF POWER SPECTR			T=1./DF	SWIN	37
UDF=1.854305/BAND*DF SWIN 39 IF (UDF. GT. 0. 5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF) +1 SWIN 41 IF (LMAX. GT. 101) GO TO 240 SWIN 42 C SPECTRAL SWIND0W SWIN 43 C SPECTRAL WINDOW SWIN 44 C W(1)=0.75*UDF SWIN 45 W(1)=0.75*UDF SWIN 46 D0 110 L=2, LMAX SWIN 47 DIF=1.570796*REAL (L-1)*UDF SWIN 48 W(L)=W (1)* (SIN (DIF) / DIF)**4 SWIN 49 110 CONTINUE SWIN 50 SWIN 51 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 55 DO 130 K=2, NFOLD-1 SWIN 55 50 130 CONTINUE SWIN 56 G (NFOLD) =F (NFOLD) **2/T SWIN 58 58 59 59			IF (BAND. EQ. 0.) GO TO 120	SWIN	38
IF (UDF. GT. 0. 5) GO TO 230 SWIN 40 LMAX=IFIX (2. /UDF) +1 SWIN 41 IF (LMAX. GT. 101) GO TO 240 SWIN 42 C SWIN 43 C SPECTRAL WINDOW C SWIN 43 C SWIN 44 C SWIN 44 C SWIN 45 W(1)=0.75*UDF SWIN 45 D 110 L=2, LMAX SWIN 47 DIF=1.570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN (DIF) / DIF)**4 SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 51 SWIN 52 C SWIN 53 SWIN 55 D0 130 K=2, NFOLD-1 SWIN 55 G (1)=F (1)**2/T SWIN 55 D0 130 K=2, NFOLD-1 SWIN 56 G (NFOLD)=F (NFOLD)**2/T SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SMOOTHING OF POWER			UDF=1.854305/BAND*DF	SWIN	39
$ \begin{array}{c} LMAX=IFIX (2. /UDF)+1 & SWIN & 41 \\ IF (LMAX. GT. 101) & GO TO 240 & SWIN & 42 \\ C & SWIN & 43 \\ C & SPECTRAL WINDOW & SWIN & 44 \\ C & SWIN & 45 \\ W(1)=0. & 75*UDF & SWIN & 45 \\ W(1)=0. & 75*UDF & SWIN & 46 \\ DO & 110 & L=2, LMAX & SWIN & 47 \\ DIF=1. & 570796*REAL (L-1)*UDF & SWIN & 48 \\ W(L)=W(1)*(SIN (DIF)/DIF)**4 & SWIN & 49 \\ 110 & CONTINUE & SWIN & 50 \\ C & CONVERSION FROM FOURIER TO POWER SPECTRUM & SWIN & 52 \\ C & SWIN & 51 \\ C & CONVERSION FROM FOURIER TO POWER SPECTRUM & SWIN & 52 \\ C & SWIN & 51 \\ C & CONVERSION FROM FOURIER TO POWER SPECTRUM & SWIN & 52 \\ C & SWIN & 51 \\ C & CONVERSION FROM FOURIER TO POWER SPECTRUM & SWIN & 52 \\ C & SWIN & 51 \\ 120 & IF (IND. NE. 100) & GO TO 140 & SWIN & 54 \\ G(1)=F(1)**2/T & SWIN & 55 \\ DO & 130 & K=2, NFOLD-1 & SWIN & 55 \\ G(K)=2. *F(K)**2/T & SWIN & 57 \\ 130 & CONTINUE & SWIN & 57 \\ 130 & CONTINUE & SWIN & 57 \\ 130 & CONTINUE & SWIN & 56 \\ G(NFOLD)=F(NFOLD)**2/T & SWIN & 56 \\ C & SMOOTHING OF POWER SPECTRUM & SWIN & 56 \\ C & SWOOTHING OF POWER SPECTRUM & SWIN & 56 \\ C & SWOOTHING OF POWER SPECTRUM & SWIN & 60 \\ C & SWOOTHING OF POWER SPECTRUM & SWIN & 61 \\ C & SWIN & 61 \\ C & SWIN & 62 \\ 140 & IF (BAND. EQ. 0.) & GO TO 210 \\ LL=LMAX*2-1 & SWIN & 64 \\ \end{array}$			IF (UDF. GT. 0. 5) GO TO 230	SWIN	40
IF (LMAX. GT. 101) GO TO 240 SWIN 42 C SWIN 43 C SPECTRAL WINDOW C SWIN 44 C SWIN 45 W(1)=0.75*UDF SWIN 46 D0 110 L=2, LMAX SWIN 47 DIF=1.570796*REAL (L-1)*UDF SWIN 47 IJF=1.570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 51 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 53 120 IF (IND. NE. 100) GO TO 140 SWIN 53 G (1)=F (1)**2/T SWIN 55 DO 130 K=2, NFOLD-1 SWIN 56 G (K)=2.*F (K)**2/T SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM C SMOOTHING OF POWER SPECTRUM C SMOOTHING OF POWER SPECTRUM C SWIN 66 C SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 64			LMAX=IFIX(2./UDF)+1	SWIN	41
$ \begin{array}{ccccc} C & & & & & & & & & & & & & & & & & & $			IF (LMAX. GT. 101) GO TO 240	SWIN	42
C SPECTRAL WINDOW SWIN 44 C SWIN 45 W(1)=0.75*UDF SWIN 46 D0 110 L=2, LMAX SWIN 47 DIF=1.570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN C CONVERSION FROM FOULTIER TO POWER SPECTRUM SWIN G(1)=F(1)**2/T SWIN 55 DO 130 K=2, NFOLD-1 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 130 CONTINUE SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN C SMOOTHING OF POWER SPECTRUM SWIN C SMOOTHING OF POWER SPECTRUM SWIN 140 IF (BAND. EQ. 0.) GO TO	С			SWIN	43
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	С		SPECTRAL WINDOW	SWIN	44
W(1)=0.75*UDF SWIN 46 D0 110 L=2, LMAX SWIN 47 DIF=1.570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C SWIN 51 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 50 130 CONTINUE SWIN 56 G(K)=2. *F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD)**2/T SWIN 59 59 59 59 59 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 57 50 50 57 50 50 57 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50	С			SWIN	45
D0 110 L=2, LMAX SWIN 47 DIF=1. 570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 SWIN 55 DO 130 K=2, NFOLD-1 SWIN 55 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 SWIN 57 130 CONTINUE SWIN 58 SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 58 G (NFOLD)=F (NFOLD)**2/T SWIN 59 SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SMIN 62 SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 SWIN 63 LL=LMAX2-1 SWIN 64 SWIN 64			W(1)=0.75*UDF	SWIN	46
DIF=1.570796*REAL (L-1)*UDF SWIN 48 W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 SWIN 55 DO 130 K=2, NFOLD-1 SWIN 57 130 CONTINUE SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 50 59 50 50 I40 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 50 50 50 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 64 50 50 50			DO 110 L=2, LMAX	SWIN	47
W(L)=W(1)*(SIN(DIF)/DIF)**4 SWIN 49 110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 50 D0 130 K=2, NFOLD-1 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 57 130 CONTINUE SWIN 58 G(NFOLD)=F (NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SMOOTHING OF POWER SPECTRUM SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64			DIF=1.570796*REAL(L-1)*UDF	SWIN	48
110 CONTINUE SWIN 50 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 50 130 SWIN 55 DO 130 K=2, NFOLD-1 SWIN 56 G(K)=2. *F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G(NFOLD)=F(NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 60 59 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SMOOTHING OF POWER SPECTRUM SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64 50			W(L)=W(1)*(SIN(DIF)/DIF)**4	SWIN	49
C SWIN 51 C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 SWIN 55 DO 130 K=2, NFOLD-1 SWIN 56 SWIN 57 130 CONTINUE SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C If (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64		110	CONTINUE	SWIN	50
C CONVERSION FROM FOURIER TO POWER SPECTRUM SWIN 52 C SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 DO 130 K=2, NFOLD-1 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G(NFOLD)=F(NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C If (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64	С			SWIN	51
C SWIN 53 120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 SWIN 55 DO 130 K=2, NFOLD-1 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G(NFOLD)=F(NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C If (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64	С		CONVERSION FROM FOURIER TO POWER SPECTRUM	SWIN	52
120 IF (IND. NE. 100) GO TO 140 SWIN 54 G(1)=F(1)**2/T SWIN 55 DO 130 K=2, NFOLD-1 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G (NFOLD)=F (NFOLD)**2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C If (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64	С			SWIN	53
G(1)=F(1)**2/T SWIN 55 D0 130 K=2, NF0LD-1 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G(NF0LD)=F(NF0LD)**2/T SWIN 59 C SW00THING OF POWER SPECTRUM SWIN 60 C SM00THING OF POWER SPECTRUM SWIN 61 C SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64		120	IF (IND. NE. 100) GO TO 140	SWIN	54
D0 130 K=2, NF0LD-1 SWIN 56 G(K)=2.*F(K)**2/T SWIN 57 130 CONTINUE SWIN 58 G(NF0LD)=F(NF0LD)**2/T SWIN 59 C SW00THING OF POWER SPECTRUM SWIN 60 C SM00THING OF POWER SPECTRUM SWIN 61 C SWIN 59 L140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64			G(1)=F(1)**2/T	SWIN	55
G (K) =2. *F (K) **2/T SWIN 57 130 CONTINUE SWIN 58 G (NFOLD) =F (NFOLD) **2/T SWIN 59 C SMOOTHING OF POWER SPECTRUM SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64			DO 130 K=2, NFOLD-1	SWIN	56
130 CONTINUE SWIN 58 G (NFOLD) = F (NFOLD) **2/T SWIN 59 C SWIO # 50 C SWIO # 50 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SWIN # 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64			G(K) = 2. *F(K) * 2/T	SWIN	57
G (NFOLD) =F (NFOLD) **2/T SWIN 59 C SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64		130	CONTINUE	SWIN	58
C SWIN 60 C SMOOTHING OF POWER SPECTRUM SWIN 61 C SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64			G (NFOLD) =F (NFOLD) **2/T	SWIN	59
C SMOOTHING OF POWER SPECTRUM SWIN 61 C SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64	С			SWIN	60
C SWIN 62 140 IF (BAND. EQ. 0.) GO TO 210 LL=LMAX*2-1 SWIN 64	С		SMOOTHING OF POWER SPECTRUM	SWIN	61
140 IF (BAND. EQ. 0.) GO TO 210 SWIN 63 LL=LMAX*2-1 SWIN 64	С			SWIN	62
LL=LMAX*2-1 SWIN 64	-	140	IF (BAND. EQ. 0.) GO TO 210	SWIN	63
			LL=LMAX*2-1	SWIN	64

		LN=LL-1+NFOLD	SWIN	65
		LT = (LL-1) * 2 + NFOLD	SWIN	66
		LE=LT-LMAX+1	SWIN	67
		DO 150 K=1, LT	SWIN	68
		G1 (K) =0.	SWIN	69
	150	CONTINUE	SWIN	70
		DO 160 K=1, NFOLD	SWIN	71
		G1 (LL-1+K) = G (K)	SWIN	72
	160	CONTINUE	SWIN	73
		DO 180 K=LMAX, LE	SWIN	74
		S=W(1)*G1(K)	SWIN	75
		DO 170 L=2, LMAX	SWIN	76
		S=S+W(L)*(G1(K-L+1)+G1(K+L-1))	SWIN	77
	170	CONTINUE	SWIN	78
		G2(K) = S	SWIN	79
	180	CONTINUE	SWIN	80
		DO 190 L=2, LMAX	SWIN	81
		G2(LL+L-1)=G2(LL+L-1)+G2(LL-L+1)	SWIN	82
		G2(LN-L+1) = G2(LN-L+1) + G2(LN+L-1)	SWIN	83
	190	CONTINUE	SWIN	84
		DO 200 K=1, NFOLD	SWIN	85
		G(K) = G2(LL-1+K)	SWIN	86
	200	CONTINUE	SWIN	87
С			SWIN	88
С		SMOOTHED FOURIER SPECTRUM	SWIN	89
С			SWIN	90
	210	F(1) = SQRT(G(1) *T)	SWIN	91
		DO 220 K=2, NFOLD-1	SWIN	92
		F(K) = SQRT(G(K) * T/2.)	SWIN	93
	220	CONTINUE	SWIN	94
		F(NFOLD) = SQRT(G(NFOLD) *T)	SWIN	95
		RETURN	SWIN	96
С			SWIN	97
	230	WRITE (6, 601)	SWIN	98
		STOP	SWIN	99
	240	WRITE (6, 602)	SWIN	100
		STOP	SWIN	101
С			SWIN	102
С		FORMAT STATEMENTS	SWIN	103
С			SWIN	104
	601	FORMAT ('BANDWIDTH IS TOO NARROW')	SWIN	105
	602	FORMAT ('BANDWIDTH IS TOO WIDE')	SWIN	106

SWIN

SWIN 107

END

[Example]

From the file EQ.01, read the time interval, number of the earthquake motion data, and digital data, and draw the Fourier spectrum by changing the bandwidth from 1.2 to 0.8 to 0.4 Hz.

```
С
      DIMENSION DATA (800), F (513), G (513), F1 (513), FF (513, 4)
С
       READ(5, 501) DT, NN, (DATA(M), M=1, NN)
       CALL FPAC (NN, DATA, 800, DT, 100, F, G, G, 513, NFOLD, DF)
       DO 130 IBAND=1,4
      BAND=REAL (4-IBAND)*0.4
       IF (IBAND. EQ. 1) BAND=0.0
      DO 110 K=1, NFOLD
      F1(K) = F(K)
  110 CONTINUE
С
       CALL SWIN (NFOLD, F1, G, 513, 100, DF, BAND)
С
      DO 120 K=1, NFOLD
      FF(K, IBAND) = F1(K)
  120 CONTINUE
  130 CONTINUE
С
       STOP
  501 FORMAT (T51, F10. 0, I10/(8F10. 0))
      END
```

Output :

The smoothed Fourier spectrum is stored in the array *FF* for each bandwidth, as shown in the following figures.



