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Skyrad.pack\_V5.0/cal\_f0: - 1/8 -

- Calculation of calibration constants for instrument -

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1. History

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2006.04.20 Renewal Version 4.2 is fixed by M.Yamano

\* A new function is added to 'temp\_Land2' version. \*

2024.01.17 Version 5.0 is fixed by M.Hashimoto

2. List of contents

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In the directory cal\_f0/ there are the following three files for

'cal\_f0' processing and this document 'ReadMe\_f0.doc'.

. cal\_f0 : the main part of source program file 'cal\_f0.f'

. cal\_f0.f : full source program file for calculation of

calibration constants for instrument.

. cal\_f0.par: parameters/options file for 'cal\_f0' processing.

3. Procedure for 'cal\_f0' processing

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3-1. Setting of 'cal\_f0.par'

The contents of 'cal\_f0.par' are as follows.

0 : IPLT (output option for plot files) - 1:create / 0:not

0 : IRPL ('ins.para' replace option) - 1:F0N/ 2:F0I/ 3:F0A/ 0:not replace

"ins.para.example" : instrument parameter file name

Usually three types of F0 (F0N, F0I and F0A) are got. F0N is F0 got

by the (normal) Langley method and F0I and F0A are by the Improved

Langley method. One output for F0N and F0I is got from one data set

of half a day (morning or afternoon). The final F0N and F0I are got

by averaging effective outputs. F0A is the one output got from all

data sets.

IPLT is a flag for making of plotting data files. If it is positive,

raw x-y data used for the Langley method fitting to get all F0N, F0I

and F0A are output to files for the respective wavelengths.

\* Making of plotting data files is a NEW function that is added to

the previous informal package 'temp\_Land2'.

IRPL is a flag for replacing option. If it is positive (1-3),

calibration constants(F0) for the instrument in the 'ins.para' file

are replaced with new ones (outputs) corresponding to number of IRPL.

\* Mechanical replacing (IRPL>0) is risky, because successful F0 outputs

depend entirely upon the quality of input data. So it is better to

replace F0 in 'ins.para' file after a careful examination of outputs.

3-2. Inputs

Input files for 'cal\_f0' processing are as follows.

F0d/\*.w??: input data files for determination of F0

[??] is number of order for the respective wavelengths. These files

are made by 'sproc4' (or 'sproc3') processing with IPF0>0 option.

3-3. 'cal\_f0' processing

(1) Make 'fname' file

'fname' is a list of data files that will be processed.

Data for 'fname' are given as file names with or without extension.

For example, the following A. and B. are equivalent. 'fname' for

other processings is also available, because the part of extension

is ignored. All data files with the respective extensions specified

by 'fname' are used for calculation.

A. B.

02012900 02012900.w01

02013000 02013000.w01

02013100 02013100.w01

: :

\* 'fname' of type B. is made automatically by means of the following

procedure.

cd F0d

ls -1 \*.w01 > ../fname

cd ../

(2) Run 'cal\_f0.e'

An executable file 'cal\_f0.e' for the source file 'cal\_f0.f' is

executed. 'ins.para' file that is specified in 'cal\_f0.par' is

necessary for execution.

cal\_f0.e

3-4. Outputs

Output files for 'cal\_f0' processing are as follows.

F0.out : The final determined F0 values (F0N, F0I and F0A)

for all wavelengths

f0\_w??.out: Detailed outputs of F0N, F0I and F0A for the respective

wavelengths

F0Ad.w?? : raw x-y data used for the Langley method fitting to get

/F0Id.w?? F0A, F0I and F0N for the respective wavelengths (if IPLT>0)

/F0Nd.w??

4. Formats of output files

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4-1. Format of F0.out file

An example for F0.out file is as follows.

WL : 4.000E-05 5.000E-05 6.750E-05 8.700E-05 1.020E-04

F0N:-9.900E+01-9.900E+01 3.431E-04 2.477E-04-9.900E+01

F0I: 1.440E-04 2.975E-04 3.632E-04 2.523E-04 2.122E-04

F0A: 1.428E-04 2.915E-04 3.554E-04 2.465E-04 2.076E-04

If IRPL in 'cal\_f0.par' is positive, calibration constants(F0) in the

'ins.para' file are automatically replaced with data of this file:

F0N(IRPL=1) or F0I(IRPL=2) or F0A(IRPL=3). Negative values for F0N,

F0I and F0A mean that no effective outputs are got.

\* Usually F0A (or F0I) is chosen for F0, if both outputs are equally

successful.

4-2. Format of f0\_w??.out files

An example for f0\_w??.out files is as follows.

5.000E-05 4 : WL NDAY

Averaging condition : NMIN = 10 TMAX = 0.300 WMAX = 2.0

SGMX = 0.100 TMIN = 0.010 WMIN = 0.0

F0N(averaged) = -9.900E+01 SGN/F0N = -99.000 ( NN = 0)

F0I(averaged) = 2.975E-04 SGI/F0I = 0.028 ( NI = 4)

Y M D AP F0N SGN TTN N F0I SGI W0I N

2003 5 29 1 3.368E-04 3.143E-02 0.657 8 2.912E-04 2.290E-02 1.075 14

2003 5 29 2 2.541E-04 3.420E-02 0.451 12 3.085E-04 1.993E-02 0.916 12

2003 5 30 1 2.700E-04 2.432E-02 0.386 11 2.882E-04 1.046E-02 1.130 12

2003 5 30 2 2.889E-04 1.164E-02 0.417 10 3.020E-04 7.189E-03 0.958 10

2.915E-04 3.545E-02 1.053 46

5.000E-05 4 : WL NDAY(SORTED)

Y M D AP F0N SGN TTN N F0I SGI W0I N

2003 5 30 2 2.889E-04 1.164E-02 0.417 10 3.020E-04 7.189E-03 0.958 10

2003 5 30 1 2.700E-04 2.432E-02 0.386 11 2.882E-04 1.046E-02 1.130 12

2003 5 29 2 2.541E-04 3.420E-02 0.451 12 3.085E-04 1.993E-02 0.916 12

2003 5 29 1 3.368E-04 3.143E-02 0.657 8 2.912E-04 2.290E-02 1.075 14

Here WL is the wavelength in centimeter and NDAY is number of data sets

of half a day. There are two tables of the same results of all data sets.

Results are sorted by time in the 1st table and by the value of SGN\*TTN

in the 2nd table respectively. One result between the 1st and the 2nd

tables is that for F0A.

Y M D : year(Y) month(M) and day(D)

AP : morning(1) and afternoon(2)

F0N : F0 got by the (normal) Langey method

SGN : RMSD of measured and fitted values for determination of F0N

TTN : total optical thickness (molecules + ozone + aerosols)

N(F0N): number of available data for determination of F0N

F0I : F0 got by the Improved Langey method

SGI : RMSD of measured and fitted values for determination of F0I

W0I : single scattering albedo

N(F0I): number of available data for determination of F0I

\* When number of available data(N) is negative, ABS(N) gives the number

and it informs that the data for linear fitting are less correlative,

that is, regarding the correlation coefficient(G) of the data, the

following relations are satisfied.

ABS(G).LT.0.99 for determination of F0N

ABS(G).LT.0.95 for determination of F0I

There are some constraints on averaging F0N and F0I.

NMIN : minimum number of N for effective data set

SGMX : maximum value of SGN and SGI

TMIN, TMAX: minimun and maximum values of TTN

WMIN, WMAX: minimun and maximum values of W0I

F0N(averaged) and F0I(averaged) are averages of data sets that satisfy

the following relations. NN and NI are numbers of the respective

averaged data sets.

F0N: N.GE.NMIN and SGN.LT.SGMX and (TTN.GT.TMIN and TTN.LT.TMAX)

F0I: N.GE.NMIN and SGI.LT.SGMX and (W0I.GT.WMIN and W0I.LT.WMAX)

\* F0N(averaged), F0I(averaged) and F0A are automatically transcribed

in the F0.out file.

4-3. Format of F0Ad.w??/ F0Id.w??/ F0Nd.w?? files

An example for F0Ad.w?? files is as follows.

yyyy mm dd \* 46 46 0.9925

1 1.7729 -9.7855

2 1.4686 -9.4938

3 1.1097 -9.1868

4 0.8594 -8.9600

5 0.9051 -8.9881

: : :

A plotting data set is made of a header and x-y data records.

Header: In order from the left

DATE : year(yyyy), month(mm) and day(dd)

AP : morning(1), afternoon(2) for F0N and F0I/ all(\*) for F0A

NE : number of available data

NN : number of all data

ABS(G): absolute value of the correlation coefficient of x-y data

After header x-y data are ABS(NE) times repeated.

No. : number of order

X : m for F0N / m\*Tsca for F0I and F0A

Y : log(F) for F0N / log(F)+m\*(TR+To3) for F0I and F0A

Here

m : airmass

F : measured direct solar irradiance

Tsca : optical thickness of aerosol scattering

TR : optical thickness of Rayleigh scattering

To3 : optical thickness of ozone absorption

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