Composition of Dr. Yokoi's program for SPAC method

[Directories]

./spacwkf
./spacwkf/bin
./spacwkf/data
./spacwkf/data/cdm_files
./spacwkf/data/multiplexed_files
./spacwkf/data/resampled_files
./spacwkf/data/results
./spacwkf/data/results/fig_geometry
./spacwkf/data/results/fig_interim
./spacwkf/data/results/fig_results
./spacwkf/data/results/fig_wave
./spacwkf/prm
./spacwkf/prm/gnuplot_script
./spacwkf/source

[FORTRAN programs (in directory ./source/)]

- b_average.for
- cf_panel.for
- comparison_plt.for
- disp_err1.for
- disp_sma1_2.for
- distazi.for
- geometry.for
- interim_plt.for
- multipx5.for
- resample5.for　(subprogram: dgflt.f)
- results_plt.for
- seewav5.for　(subprogram: dgflt.f, PSCAL.F, pltwv2.for)
- seg2cmd.for
- vel_model_plt.for
- zcorrel5_2.for

*change “wxt” to x11(IISEE windows PC), aqua (Mac OS X)

[Parameter files（in directory ./spacwkf/prm/）]

- b_average.prm
- disp_sma1_2.prm
- distazi.prm
- multipx5.prm
- resample5.prm
- seewav5.prm
- seg2cmd.prm
- str_range.dat
- vel_model_plt.prm
- zcorrel5_2.prm

Simplified procedures of Dr. Yokoi's program for SPAC method

1. INSTALLATION OF FIELD DATA

1.1 Convert from seg2 data to cdm (ASCII) format data

Parameters ./spacwkf/prm/seg2cmd.prm
→ seg2 file name, channel number, number of measurement in the same array, scale factor

Program ./source/seg2cmd.for

Command "./seg2cmd.exe"

Inputs ./spc400*xx*.sg2

Outputs ./spc0*xxyy*.cdm
(*xx*: number of measurement, *yy*: channel)

1.2 Copy cdm files to the following directory
./spacwkf/data/cdm_files/

2. PREPARATION OF MULTI CHANNEL FILES

Parameters ./spacwkf/prm/multipx5.prm
→ number of sensors, sampling frequency, data length, output file label and number of measurement

Program ./source/multipx5.for

Command "./multipx5.exe"

Inputs ./spacwkf/data/cdm_files/spc0*xxyy*.cdm

Outputs ./spacwkf/data/multiplexed_files/*aaxx*.dat
aa: label (in multipx.prm)

3. PLOTTING OBSERVED WAVEFORMS

Parameters ./spacwkf/prm/seewav5.prm
→ bandpass filter, plotting size and
input files (i.e. output files in 1.5)
Program ./source/seewav5.for
Command "./seewav5.exe"
Inputs ./spacwkf/data/multiplexed_files/*aaxx*.dat
Outputs ./spacwkf/data/results/fig_wave/*aaxx*.ps

4. RE-SAMPLING AND SCREENING

Parameters ./spacwkf/prm/resample5.prm
→ time interval, skip number, threshold of amplitude,
acceptable range of averaged amplitudes,
output file name (6 character + '.dat') and
data length for one block data
Program ./source/resample5.for
Command "./resample5.exe"
Inputs ./spacwkf/data/multiplexed_files/*aaxx*.dat
Outputs ./spacwkf/data/resampled_files/*ABCDEF*.dat

5. PREPROCESSING FOR HADDLE-TEST DATA

Apply same procedure (1 and 3) to haddle-test data
Outputs ./spacwkf/data/resampled_files/*HDLE*.dat

6. CALCULATION OF INTER-STATION DISTANCES, AZIMUTHS

Parameters ./spacwkf/prm/distazi.prm

→ number of stations, array label, location of sensors

[1: distance (x, y), 2: (Lat. and Lon.), or

3: (distance and azimuth from an arbitrary sensor)]

Program ./source/distazi.for

Command "./distazi.exe"

Outputs ./spacwkf/data/results/distazi.dat

7. PLOTTING ARRAY GEOMETRY

7.1 Setting sensor locations in the X-Y plane

Parameters ./spacwkf/prm/distazi.prm (same as 6)

Program ./source/geometry.for

Command "./geometry.exe"

Input ./spacwkf/data/results/distazi.dat

Outputs ./spacwkf/data/results/geometry.dat

./geometry.plt

./spacwkf/prm/gnuplt_script/geometry_*bb*.plt

7.2 Plotting the array geometry

Command "gnuplot ./geometry.plt"

Output ./spacwkf/data/results/fig_geometry/geometry_*bb*.ps

bb: array label (set in distazi.prm)

8. CALCULATION OF SPAC COEFFICIENTS

Parameters ./spacwkf/prm/zcorrel5_2.prm

→ frequency range, time intervals, windowing,
input data files (output files in 4),
haddle test data (output file in 4; 0 for skip),
and station pairs that have same distances

Program ./source/zcorrel5_2.for

Command "./zcorrel5_2.exe"

Inputs ./spacwkf/data/resampled_files/*ABCD*.dat

Outputs ./spacwkf/data/results/*ABCD*_coh.dat (coherence)
./spacwkf/data/results/*ABCD*_psp.dat (power spectra)
./spacwkf/data/results/SPACLA.dat (SPAC coeff.)
./spacwkf/data/results/FRNGLA.dat (zero-crossing)

9. PLOTTING OF SPAC COEFFICIENTS

9.1 Making scripts for plotting

Parameters ./spacwkf/prm/distazi.prm (same as 6)
./spacwkf/prm/zcorrel5_2.prm (same as 8)

Program ./source/interim_plt.for

Command "./interim_plt.exe"

Inputs ./spacwkf/data/results/*ABCD*_cor.dat
./spacwkf/data/results/*ABCD*_psp.dat
./spacwkf/data/results/SPACLA.dat

Outputs ./spacwkf/prm/gnuplt_script/*ABCD*_coh.plt
./spacwkf/prm/gnuplt_script/*ABCD*_psp.plt
./spacwkf/prm/gnuplt_script/SPAC_NoX.plt
./spacwkf/prm/gnuplt_script/SPACLA.plt

9.2 Plotting of SPAC coeficcients

Command “gnuplot ./spacwkf/prm/gnuplt_script/*ABCD*_coh.plt”
“gnuplot ./spacwkf/prm/gnuplt_script/*ABCD*_psp.plt”
“gnuplot ./spacwkf/prm/gnuplt_script/SPAC_NoX.plt”
“gnuplot ./spacwkf/prm/gnuplt_script/SPACLA.plt”

Outputs ./spacwkf/data/results/fig_interim/*ABCD*_coh.ps
./spacwkf/data/results/fig_interim/*ABCD*_coh.ps
./spacwkf/data/results/fig_interim/SPAC_NoX.ps
./spacwkf/data/results/fig_interim/SPACLA.ps

10. DETARMINATION OF DISPERSION CURVE

Parameters ./spacwkf/prm/b_average.prm
→ frequency range (whole data, each station pair),
file name of SPAC coefficient (SPACLA.dat in 8)

Program ./source/b_average.for

Command “./b_average.exe”

Inputs ./spacwkf/data/results/SPACLA.dat

Outputs ./spacwkf/data/results/comparison.dat
(parameters that checks the glade of fitting)
./spacwkf/data/results/vel_model.dat
(dispersion curve with standard deviations)

11. PLOTTING OF DISPERSION CURVE

11.1 Making a script for plotting

Parameter ./spacwkf/prm/vel_model_plt.prm
→ label, frequency range, phase velocity range

Program ./source/vel_model_plt.for

Command “./vel_model_plt.exe”

Input ./spacwkf/data/results/vel_model.dat

Output ./spacwkf/prm/gnuplt_script/vel_model.plt

11.2 Plotting dispersion curve

Command “gnuplot ./spacwkf/prm/gnuplt_script/vel_model.plt”

Output ./spacwkf/data/results/fig_results/vel_model.ps

11.3 Screening by the wavelength

Parameters ./spacwkf/prm/b_average.prm (same as 9)

./spacwkf/prm/vel_model_plt.prm

Program ./source/cf_panel.for

Command “./cf_panel.exe”

Inputs ./spacwkf/data/results/vel_model.dat

./spacwkf/data/results/SPACLA.dat

Outputs ./spacwkf/prm/gnuplt_script/cf_panel.plt

./spacwkf/data/results/temp.dat

./spacwkf/data/results/temp1.dat

./spacwkf/data/results/temp2.dat

./spacwkf/data/results/temp3.dat

./spacwkf/data/results/temp4.dat

./spacwkf/data/results/temp5.dat

11.4 Plotting result of screening

Command “gnuplot ./spacwkf/prm/gnuplt_script/cf_panel.plt”

Output ./spacwkf/data/results/fig_results/cf_panel.ps

11.5 Checking the glade of fitting between results & SPAC coefficient

Input ./spacwkf/data/results/vel_model.dat

./spacwkf/data/results/temp1.dat

./spacwkf/data/results/temp2.dat

Program ./source/comparison_plt.for

Command “./comparison_plt.exe”

→ Input frequency for comparison

Input ./spacwkf/data/results/comparison.dat

Output ./spacwkf/prm/gnuplt_script/comparison.plt

11.6 Plotting SPAC coeffi. and Bessel function as a function of distance

Command "gnuplot ./spacwkf/prm/gnuplt_script/comparison.plt"

Output ./spacwkf/data/results/fig_results/comparison.ps

12. HEURISTIC SEARCH OF S-WAVE STRUCTURE MODEL

Parameters ./spacwkf/prm/disp_sma1_2.prm

→ setting for empirical relationship

Program ./source/disp_sma1_2.for

Command "./disp_sma1_2.exe"

Input ./spacwkf/data/results/vel_model.dat

./spacwkf/prm/str_range.dat

→ number of layers, Vp and density for each layer

→ ranges of thickness and Vs for each layer

Outputs ./spacwkf/data/results/disp_cal.dat

./spacwkf/data/results/vel_cal.dat

13. PLOTTING OF S-WAVE STRUCTURE MODEL

13.1 Making a script for plotting

Parameters ./spacwkf/prm/vel_model_plt.prm

→ setting for plotting axes range

Program ./source/results_plt.for

Command "./results_plt.exe"

Input ./spacwkf/data/results/disp_cal.dat

./spacwkf/data/results/temp.dat

./spacwkf/data/results/temp1.dat

./spacwkf/data/results/temp2.dat

./spacwkf/data/results/temp3.dat

./spacwkf/data/results/temp4.dat

Outputs ./spacwkf/prm/disp_cal.plt

./spacwkf/prm/vs_structure.plt

13.2 Plotting observed and theoretical dispersion curves

Command “gnuplot ./spacwkf/prm/disp_cal.plt”

Outputs ./spacwkf/data/fig_results/disp_cal.ps

13.3 Plotting estimated S-wave velocity structure

Command “gnuplot ./spacwkf/prm/vs_structure.plt”

Outputs ./spacwkf/data/fig_results/vs_structure.ps