Package ANRAY, version 4.10 [1]

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The new version of the program package ANRAY, version 4.10, differs from the previous version 4.01 by several modifications. The most important are the following:

a) The package ANRAY 4.10 contains the first test version of a program WEAKAN for the calculation of qS waves in inhomogeneous weakly anisotropic media or in vicinity of quasi-shear wave singularities like a kiss or an intersection singularity. The algorithm used in the program WEAKAN is based on the zero-order quasi-isotropic (QI) approximation, see Pšenčík (1997, 1998). The program ANRAY is used to calculate a ray and necessary quantities along it in a background isotropic medium. The file with these data together with another file specifying distribution of elastic parameters in a weakly anisotropic model are then used in the program WEAKAN. In this program, two coupled linear ordinary differential equations are solved, for frequencies from a considered frequency range, along the ray. A modified Euler method is used to solve the equations. The solutions are the amplitudes in the zero-order QI approximation. Resulting amplitudes are used in the program FRESAN to calculate the frequency response. Further procedure is the same as in previous versions of the ANRAY package.

b) The formatted form of input data was substituted by list-directed input (free format). This should make the work with input data more comfortable.

c) Many minor modifications were made, which should make the use of the program package more reliable and/or comfortable. Among most important are the modifications in the computation of polarization vectors in anisotropic media. At each point of a ray tests are made whether the orientation of the polarization vector is not reversed with respect to the previous point of the ray. Present version of the ANRAY package makes also possible plotting of sections of velocity surfaces for an arbitrary point of the model. The sections can be plotted either in the form of polar diagrams or plots of one quadrant of a section of a velocity surface in a rectangular frame with angles along horizontal axis and phase or group velocity or slowness along vertical axis. Double precission was introduced in the solution of the eigenvalue problem, which led to more precise determination of phase velocities for a specified direction and to greater stability of the two-point ray tracing procedure.

As in previous versions, many bugs were removed but with new possibilities, new bugs were surely introduced. The users are, therefore, kindly asked to report any problems they may encounter.

[1] Seismic Waves in Complex 3-D Structures, Report 7 (Department of Geophysics, Charles University, Prague 1998)

Perl script `f.pl` of package FORMS is designed to compile a single Fortran program. Everybody should edit it manually to use his own Fortran compiler and linker. After that the programs of package ANRAY may simply be compiled and linked by executing command "`perl fanray.pl`".

REFERENCES

Pšenčík,I.,1997. Green functions for inhomogeneous weakly anisotropic media. In: Seismic Waves in Complex 3-D Structures, Report 6, pp.263-282, Dept.of Geophysics, Charles University Prague.

Pšenčík,I., 1998. Quasi–shear waves in the zero–order approximation of the quasi–isotropic approach. Preliminary results. In: Seismic Waves in Complex 3-D Structures, Report 7, Dept.of Geophysics, Charles University Prague, this issue.