Research topics (May 2011)

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1. First-order perturbation of polarization vectors in the coupling ray theory.

2. Prevailing-frequency approximation of the coupling ray theory (could facilitate coupling-ray-theory migrations; must be tested in forward modelling first).

3. Including perturbations of S-wave travel times into the interpolation within common-ray cells in anisotropic media.

4. Common-source Kirchhoff prestack depth migration with S waves.

5. Linearized inversion based on wavefield sensitivity to structural Gabor functions (sensitivity Gaussian packets).

6. Stress-induced anisotropy.

7. Ray theory for $c_{ijkl} \neq c_{klij}$: different transport equation.

8. Ray theory for electromagnetic waves in heterogeneous bianisotropic media.

9. Transformation of the elastic ray series at structural interfaces.

10. Applicability of ray methods to cubic-spline velocity models (finite zero-order amplitudes, infinite first-order amplitudes)

11. Complete ray tracing through structural interfaces.

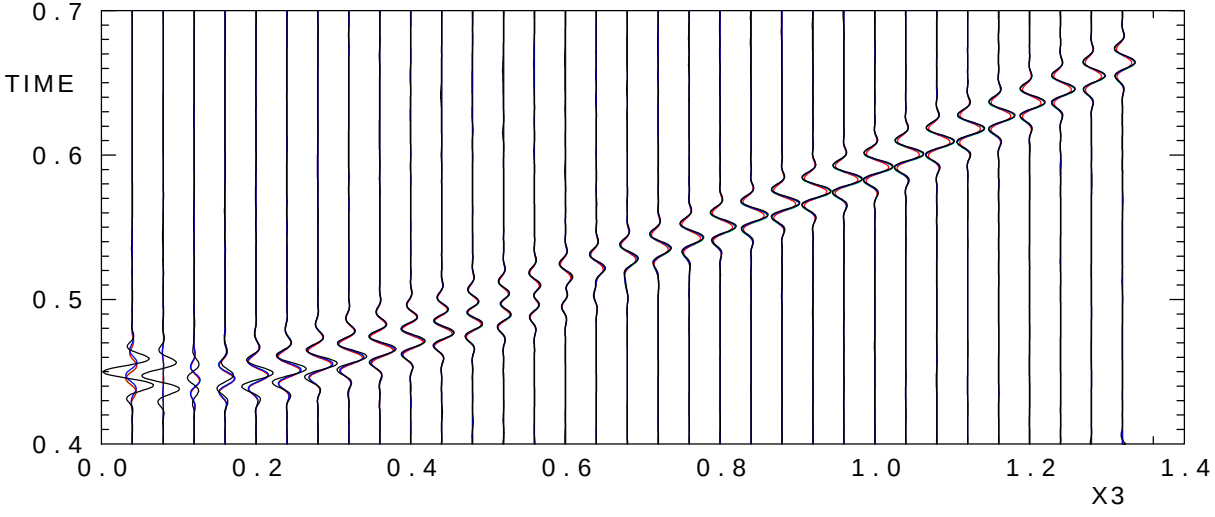
12. Derivation of the weak-contrast reflection-transmission coefficients from the Born approximation?

13. Applicability of the Born approximation: Study of the nonlinearity of ray-theory seismograms with respect to perturbations of the velocity model.

14. Finite-difference schemes at structural interfaces.

1. First-order perturbation of polarization vectors in the coupling ray theory

Model SC2, radial component:



We are calculating the first-order perturbation of the slowness vector in order to calculate the second-order perturbation of travel time. Unfortunately, we forgot to replace the reference polarization vectors by the perturbed polarization vectors.

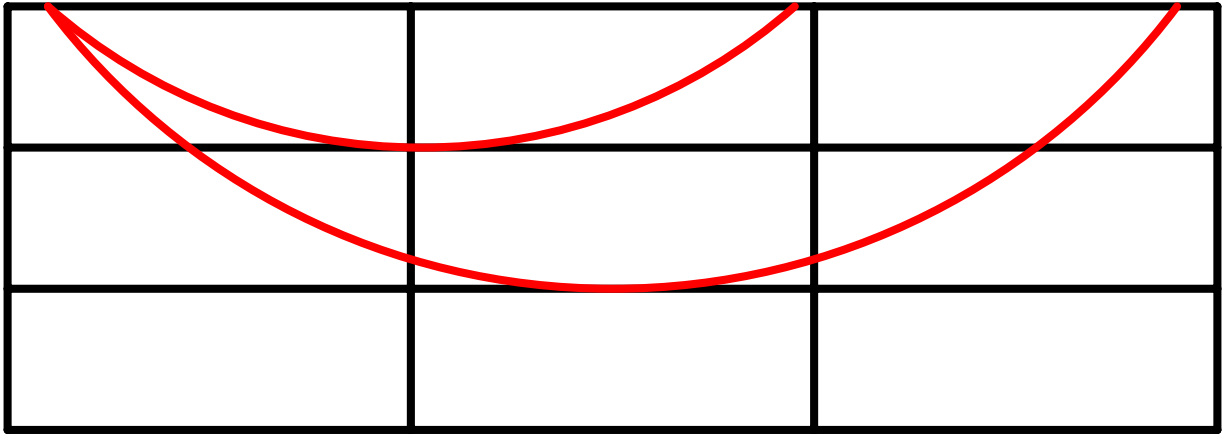
6. Stress-induced anisotropy

Isotropic material (2 elastic parameters) or transversely isotropic material (8 elastic parameters) without stress — shallow depths only.

Isotropic nonlinear material under stress
$\Longrightarrow$ Orthotropic material
(orthorhombic symmetry, 12 elastic parameters)

Transversely isotropic nonlinear material under stress
$\Longrightarrow$ Generally anisotropic material
(triclinic symmetry, 21 elastic parameters)

10. Applicability of ray methods to cubic-spline velocity models



Rays touching the B-spline grid planes:
Finite zero-order amplitudes.
Infinite first-order amplitudes.