Seismic Modeling, Migration, and Velocity Inversion

Questions

Bee Bednar

Panorama Technologies, Inc.
14811 St Marys Lane, Suite 150
Houston TX 77079

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Outline

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Questions

- 1. A chief cause of anisotropy in rocks is due to
  - a. Rock texture such as lamination, fractures or cracks
  - b. The volume of absorbed fluids
  - c. Sub-areal exposure
  - d. Metamorphosis
- 2.Exposed shales are easily recognize by
  - a. Lamination
  - b. Talus slopes
  - c. Their characteristic black color
  - d. The number of fossils
- 3.Shear velocities in rocks are
  - a. A function of their compressional modulus
  - b. A function of the shear modulus
  - c. Both a and b
  - d. None of the above
- 4.Orthorhombic isotropy is characterized by
  - a. Five independent volumes
  - b. Twenty-one independent volumes
  - c. Nine independent volumes
  - d. Eighteen independent volumes

Questions

- 5.Tilted Transverse Isotropy refers to
  - a. Orthorhombic isotropy with a vertical symmetry axis
  - b. Vertical Transverse Isotropy with a tilted axis of symmetry
  - c. An isotropic elastic medium with a horizontal symmetry axis
  - d. None of the above
- 6.Beam migrations are based on
  - a. Ray tracing light beams in constant velocity
  - b. Estimates of the local subsurface dip
  - c. Estimates of apparent dip
  - d. Smearing trace amplitudes over equal travel time curves
- 7.The difference between time and depth migration is
  - a. None
  - b. Time images along image rays while depth images along vertical rays
  - c. Time images along vertical rays while depth images along image rays
  - d. Time uses a full 3D velocity volume while depth does not
- 8.The migration approach that is closest to true amplitude is
  - a. Full two-way (reverse time migration)
  - b. Kirchhoff prestack time migration
  - c. Gaussian Beam migration
  - d. One-way phase screen with one additional bounce

Questions

- 9.Two distinct rays arriving at a fixed subsurface point
  - a. Can have identical take-off angles
  - b. Can have identical incident angles
  - c. Can have different take-off angles but identical incidence angles
  - d. None of the above
- 10.The full wave-equation is based on
  - a. Newton's second law of motion and HookeÕs law
  - b. Hooke's law
  - c. Newton's second law of motion
  - d. Newton's law of gravitational attraction
- 11.Forward modeling
  - a. Has no part in seismic migration
  - b. It's the basis for all migration algorithms
  - c. Is used to forward propagate time-reversed trace
  - d. Both b and c
- 12.The aliasing of dipping events
  - a. Is related only to dip
  - b. Is related to dip and frequency
  - c. Is a relationship between surface spacing, dip, and frequency
  - d. None of the above

Questions

- 13. Mathematically, wave equation based migration algorithms
  - a. Assume that the Earth consists of flat layers
  - b. Assume that the sources and receivers are actually arrays
  - c. Assume that sources and receivers are point sources and receivers
  - d. Assumes a line source and are point receivers
- 14. Kirchhoff migration
  - a. Is not wave equation based
  - b. Is based on an approximation to the wave equation
  - c. Cannot resolve steeply dipping events
  - d. Both b and c
- 15. Phase Screen migration
  - a. Is a full two-way method
  - b. Is not based on factorization of the wave equation
  - c. Correctly handles dips steeper than 90 degrees
  - d. Cannot images turning rays
- 16. Gaussian Beam migration
  - a. Is misnamed. Its not really a beam based method
  - b. Is a beam based method that images only on the central ray
  - c. Is a beam based method that images only off the central ray
  - d. Is a beam based method that images along and off the central ray

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- 17. When properly implemented, Gaussian Beam migration
  - a. Is very close to a true two-way method
  - b. Is the best one-way method available
  - c. Images up to 108 degrees but no higher
  - d. Is based on factorization of the wave equation into two one-way equations
- 18. Full waveform inversion
  - a. Computes AVO slope and intercept to estimate subsurface velocities
  - b. Had nothing to do with modeling or migration
  - c. Is based on full waveform modeling and migration
  - d. Can be applied only to marine data
- 19. Full waveform inversion
  - a. Can only be used in 2D
  - b. Is an iterative scheme using RTM to calculate the velocity model update
  - c. Can only be used in 3D
  - d. Calculates the velocity model update through tomographic raytracing
- 20. According to mathematical theory
  - a. Migration is independent of acquisition geometry and design
  - b. Migration requires acquisition at the largest possible spacings
  - c. Wide azimuth densely spaced acquisition is optimum
  - d. None of the above

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- 21. Acquisition design
  - a. Has no affect on frequency content
  - b. Is independent of sample increments
  - c. Is optimum when the spacing is as large as possible
  - d. Is optimum when the spacing is as small as possible
- 22. V_{nmo} velocity is defined to be
  - a. The best estimate of vertical or well velocity
  - b. When divided by two is a good estimate of horizontal shear velocity
  - c. The best estimate of horizontal velocity
  - d. The velocity that produces the best isotropic migration image
- 23. The anisotropic parameter δ
  - a. Can be thought of as governing horizontal wave speed
  - b. Can be thought of as governing percentage depth miss ties
  - c. Is the ratio of the horizontal velocity to the vertical velocity minus 1
  - d. Is a function of the two shear velocities in anisotropic propagation
- 24. The anisotropic parameter ϵ
  - a. Can be thought of as governing horizontal wave speed
  - b. Can be thought of as governing percentage depth miss ties
  - c. Is given by the formula $.5(\frac{V_{nmo}}{V_{vert}} - 1)$
  - d. Is a function of the two shear velocities in anisotropic propagation

Questions

- 25. Anisotropic waves
  - a. Consists of a compressional and two shear waves
  - b. Propagate with velocities that are angle dependent
  - c. Constantly convert from on type to the other
  - d. All of the above
- 26. Based on theory and case studies
  - a. Single linear array of receivers produces the best results
  - b. Wide azimuth acquisition is better than all other methods
  - c. Optimal acquisition is independent of receiver placement
  - d. None of the above
- 27. Theoretical analysis, case studies, and synthetic tests
  - a. Show that full waveform inversion does not work
  - b. Show that inversion depends mostly on high frequencies
  - c. Show that full wave form always performs perfectly
  - d. Show that inversions strong depends on low frequencies
- 28. Migration algorithms
  - a. Cannot provide information about velocity errors
  - b. Provide algorithm dependent indicators of velocity errors
  - c. Are insensitive to velocity errors
  - d. Work best when applied in the time domain

Questions

- 29. All depth migration algorithms can be thought of as
  - a Forward and backward propagation coupled by an imaging condition
  - b. A lateral shift followed by a vertical shift
  - c. Finding the termination of an apparent dip based ray
  - d. All of the above
- 30. Raytracing is an integral part of
  - a. Gaussian Beam Migration
  - b. Classical Beam Migration
  - c. Kirchhoff Migration
  - d. All of the above
- 31. Raytracing is not an integral part of
  - a. Reverse Time Migration
  - b. Gaussian Beam Migration
  - c. Kirchhoff Migration
  - d. All of the above
- 32. Kirchhoff Migration
  - a. Is not based on the wave equation
  - b. Is a full waveform method
  - c. Is based on the wave equation
  - d. All of the above

Questions?