Summary: WIT report 2006

IMAGING

von Steht presents a poststack imaging sequence based on the CRS method for common offset adapted to handle vertical seismic profiling (VSP) walkaway data. A vivid synthetic example is used to visualize the quality of the image after depth migration. Furthermore the CRS-based wavefield separation for multicomponent data is applied for this specific geometry.

Garabito et al tested the performance of VFSA and SA optimization algorithms in Marmousi dataset by using the CRS stacking method. They observed that SA is more robust than VFSA algorithm. The results of the one-step CRS stack present a better resolution (good continuity of reflector horizons) in comparison with the results of the three-steps CRS stacking strategy.

Garabito et al derived a particular traveltime formula for paraxial rays in the vicinity of a central ray associated to a diffraction point in depth. This formula presents a good fitting with respect to the reflected events. They propose this formula as an alternative to simulate Common-Offset (CO) sections. Finally, propose a new strategy to estimate the five parameters in the Finite-Offset (FO) CRS stacking method. For the first third steps use the $SimulatedAnnealing(SA)$ global optimization method. For the fourth step recommend to use the $Quasi - Newton(QN)$ local optimization algorithm.

Meier et al. give a short comparison between two tomographic inversion schemes, namely prestack stereotomography and NIP-wave tomography. The results are compared for a simple synthetic dataset and for a real marine dataset from the Eastern Mediterranean. The differences are discussed with respect to the different inversion approaches.

Kienast presents a real data example for CRS stack based limited-aperture migration in time and depth domain. Kinematic as well as dynamic aspects are considered for time and depth migration, and compared to conventional results.

Klüver presents a new technique for the determination of migration velocity models. The method aims at kinematically fitting common image gathers and common reflection point gathers associated with selected picks in a poststack zero offset section.

Iversen and Tygel present a 3D time-to-depth conversion method that is based on tracing image rays into depth using a given time-migration velocity field. The method can be used both as a mapping scheme (which converts selected events in the time-migrated section into depth) or as an imaging scheme (which converts a time-migrated section into its corresponding full depth migrated section). Although all presented formulas are fully 3D, the method is illustrated in its simpler 2D case.

Ursin and Tygel introduce natural amplitudes for the one-way normal and NIP waves, which provide a useful decomposition of the amplitude of the zero-offset ray. A possible application of the decomposition to a new true-amplitude migration scheme is also described.

Schleicher et al. derive a new image wave equation for remigration in elliptically anisotropic media

by reparameterization of the kinematic expressions. A simple numerical example confirms that this image wave equation, which is a kind of medium-dependent one-way wave equation, can be used to improve well-ties, thus providing an estimate of the vertical velocity.

Anikiev et al. apply a modified diffraction stack method to the problem of source localization. They investigate the localization with known and unknown velocity models.

Vanelle and Gajewski explain how their traveltime-based strategy for true-amplitude migration can be extended to include anisotropy. The new method provides a true-amplitude migrated image without requiring dynamic ray tracing (DRT), which is cumbersome in the presence of anisotropy. A simple example demonstrates that in addition to the depth image, the reconstruction of the reflection amplitudes for anisotropic multi-component data leads to the correct result.

Melo Silva et al. transfer the concepts of true-amplitude one-way wave equations to Gazdag's phase-shift migration. By analytically solving the true-amplitude one-way wave equations in vertically inhomogeneous media, they show that a true-amplitude phase-shift migration consists of the same phase correction as in standard phase-shift migration, plus an amplitude correction that can be applied at each depth level. Simple numerical examples demostrate the improvement of the amplitudes in vertically inhomogeneous media.

Schleicher et al. compare the effects of different imaging conditions for common-shot wave equation migration on the migration artifacts and on the migration amplitudes. The conclude that the most robust imaging condition is one that divides the convolved up- and downgoing wavefields after inverse Fourier transform.

Amazonas et al. show how complex Padé approximations can be used to derive two complex wide-angle pre-stack depth migration algorithms: finite differences (FD) and Fourier finite differences (FFD). These migration methods can handle evanescent waves and have improved impulse responses. The treatment of evanescent waves with the complex Padé approximation stabilizes the FFD algorithm and is more efficient computationally than Biondi's unconditionally stable FFD algorithm.

Yoon et al. applied CRS stack method to seismic reflection data from the North German basin which were recently released by the industry. The land data sets acquired in the early 80ies were reprocessed with the focus on the deeper structures within the basin. The images provide new insight for the sedimentary cover of the basin and for the deeper parts of the crust. The results display an almost flat Moho discontinuity even in the area of the Glückstadt Graben where a lower crustal high density body was discovered. The interpretation is in good agreement with recent results from gravity modeling in this area.

ROCK PHYSICS AND WAVES IN RANDOM MEDIA

Grosfeld and Santos review some of the most used attributes for AVO analysis and introduce a new one based on the reflection impedance function.

OTHER TOPICS

Barbosa et al. extend stereotomography to general anisotropic media and present an implementation for elliptical and anelliptical anisotropy, Numerical examples demonstrate the validity of the present approach for qP events and mild anisotropy, pointing towards the importance of transmission events from multiple-offset VSP experiments for the success of the approach.

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