HARTENERGY VIENNA | WEDNESDAY
E&P DAILY NEWS
2011 EAGE Conference & Exhibition

Local and Global Imaging Solutions

Reducing the non-uniqueness of the seismic method.

The rich- and wide-azimuth seismic acquisition geometries that have taken centre stage in both onshore and offshore exploration assets have empowered exploration geophysicists with the ability to recover images and information not achievable a decade ago. These images and information do not come easy, as the cost associated with compute intensive migrations such as Reverse Time Migration (RTM) and the complexity associated with modelling and parameterizing velocity data or determining stress directions in anisotropic regimes can easily overcome the new imaging and information capacity of rich azimuth data.

Paradigm says that, to address these difficulties, it has engineered two imaging systems, one global and the other local, to fully exploit the azimuth richness of modern seismic acquisition. In general terms, the global imaging solutions are reserved for structural imaging and structural attribute extraction. Time permitting, they may be deployed throughout the velocity model building process and, depending on the imaging objective, may be used for final imaging and interpretation. Local imaging solutions, on the other hand, "localize" the imaging operator for the purpose of high-resolution velocity determination, high-resolution amplitude determination, or localized imaging.

The Paradigm global Imaging solution implements RTM with support for multi-core (CPU or GPU) computation, isotropic or anisotropic imaging, surface seismic imaging and subsurface VSP imaging, and imaging from constant or irregular datums. With this operational and computational flexibility, geophysicists are able to extract structural images and attributes (e.g. dip and azimuth) throughout the entirety of the velocity model building and imaging process. These images can be used to constrain operations performed by the local imaging solution.

Paradigm says its local imaging solution - EarthStudy 360 - is specially designed for proper rich and wide azimuth acquisitions and eliminates all the limitations, biasing, averaging and approximations associated with sectoring the fully recorded seismic wavefield based on source-to-receiver azimuths. Based on a rich bottom-up ray tracing that "shoots" rays in all angles and directions, the system is able to capture and preserve seismic data in-situ and sampled continuously in azimuth. This ray tracing and mapping procedure is carried out in a local reference system (Local Angle Domain) where the fully recorded seismic wavefield can be decomposed into two independent but complementary sets of full azimuth gathers. The first set of gathers (reflection) contains a continuous 360 degrees sampling of reflectivity (amplitude) information as a function of reflection (opening) angle. These gathers provide a data structure to detect and measure velocity anisotropy, to predict lithology, to detect stress directions, and to update velocity models.

The second set of gathers (directional) contains a continuous azimuthal sampling of the total scattered energy as a function of the dip and azimuth of local reflecting surfaces. Since the total scattered energy contains both continuous (specular) and discontinuous (diffracted) energy, the method is able to easily differentiate and create images that emphasize these two components. Both the local and global imaging solutions serve independent but complementary roles and are selectively called upon to accommodate different workflows that adapt to the exploration or development objective. More importantly, the proper treatment of seismic azimuth afforded by the EarthStudy 360 local imaging solution provides a system to reduce the non-uniqueness of the seismic method, a tremendous advance in the imaging, characterization, and interpretation of seismic data. For more information, visit Paradigm at booth 1445.