Velocity Model Building

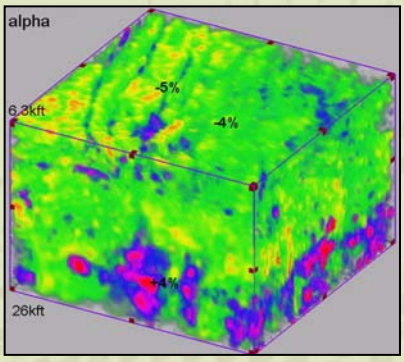
GX Technology (GXT) has a mature and production-proven suite of tools for pre-stack velocity analysis and model building. It combines a general topological engine for arbitrary layered or non-layered model representation with a set of tools to analyze gathers and stacks for defining interval velocity. An initial velocity model is built using such data as RMS stacking velocities, picked horizons, interval velocities, vertical compaction gradients, well logs, and anisotropy parameters. The first iteration of pre-stack depth migration uses this initial velocity model to obtain depth migrated gathers or stacks for further iterative velocity analysis and model building. Methods of velocity estimation include tomography, gather-flattening techniques, and scans on velocity-perturbed stacks. These approaches may be combined as needed to obtain the best possible velocity model. In addition, the flexible algorithm enables the construction of project-consistent velocity models for multiple 2D lines.

KEY FEATURES AND BENEFITS

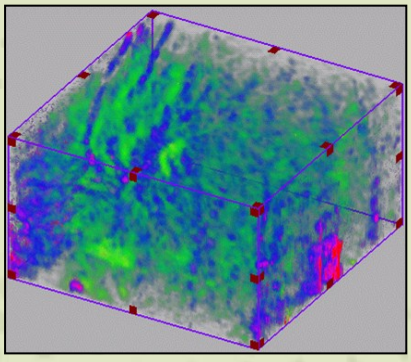
Horizon Interpretation – Horizons may be interpreted on target lines, volumes, or slabs. Various editing and picking features are available to speed the interpretation process. Horizons may be exported and imported to and from other software packages.

Velocity Model Building – The model builder is used to construct a topography model from the picked horizons. It is a versatile layer management tool allowing the user to build a variety of complicated velocity models with faulted blocks, lenses, overhanging salt bodies, etc.

Layered and Non-layered Models – Velocity models may be built layered or non-layered, or the two methods may be combined, depending on the geologic complexity. For instance, models of less compacted lithologies are typically built in layers while models of more compacted lithologies are typically built without layers.



Initial errors calculated from a gather volume using a 3D fully automatic picking routine


Residual errors left after an iterative 3D tomography update

GX TECHNOLOGY

KEY FEATURES AND BENEFITS (Continued)

Focusing Analysis – Focusing analysis is used for the picking and QC of focusing panels of image gathers for both layered and non-layered models. In turbo depth focusing, a gather is migrated with one velocity function, while in alpha depth focusing, a suite of gathers is obtained by migrating with a range of velocity functions.

Alpha Scans – This utility is used for picking imaged sections, each of which has been migrated with a velocity model that represents a constant percentage perturbation relative to the base model. This type of velocity analysis is especially advantageous in low fold, low signal-to-noise ratio land data because the velocity picking is based on evaluating the geology rather than gathers. Input to the process can be imaged sections obtained from Kirchhoff or wave equation migration.

Autopicking and Tomography – Autopicking is used to automatically pick the residual moveout of events on the depth or time migrated gathers as a function of common depth point, offset, and depth (or time). This information is used as input to GXT's sophisticated tomography solution for direct inversion into an updated interval velocity model.

Velocity Model QC – Pick quality may be assessed by inspection of lateral consistency using different display modes. Event flatness resulting from an updated velocity model may be estimated prior to migration.

Anisotropy – Continuous gridded eta estimation tools are available that, in conjunction with calibration to well data, provides input for anisotropic migration.

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