

# Building Geologically-Constrained Velocity Models

## An Emerson E&P Software Geoscience Service

Rapid sedimentary depositional rates in offshore deep water salt Velocity determination and modeling of the spatial distributions of velocity data are the keys to the seismic method. The velocity model plays a role in every process that produces a seismic image or transforms seismic data to a derivative property describing subsurface conditions or properties. Although velocity models can vary with the functional processes they drive (e.g. migration, AVA, seismic impedance inversion, time-to-depth conversion, pore pressure prediction), all velocity models require a robust structural and stratigraphic framework. Without this foundation, velocity models will incorrectly simulate the propagations and transmissions of energy in the subsurface, resulting in artifacts, mispositioning of data, and incorrect transformations to formation and subsurface properties.

Building this velocity foundation is not trivial, particularly in areas that are extensively deformed (faulted and folded) or disrupted by complex intrusive bodies like salt and basalt. Additionally, velocity model building activities (e.g. model-based tomography, interpolation of well velocities along stratigraphy, calibration of seismic and well velocities) are highly variable, with different data integration challenges that include multi-z valued interpretation data, isotropic and anisotropic velocity data, lithologic velocities, and borehole velocity measurements.

To resolve these challenges, the Emerson E&P Software Geoscience Services team delivers velocity models that honor the geology without any approximations or limitations. For seismic imaging, velocity

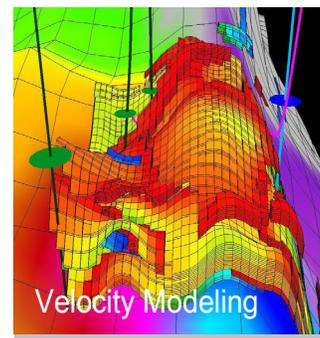
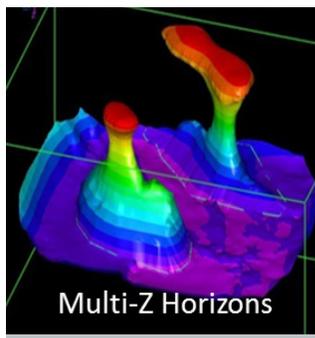
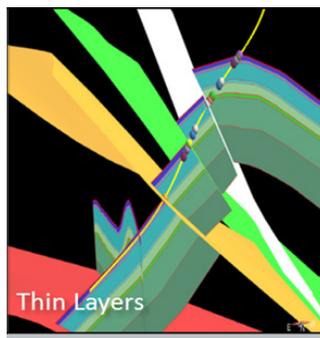
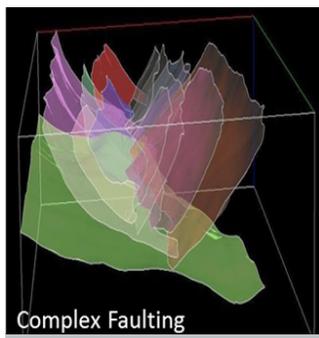
models are sealed by construction: All faults are included with proper salt-sediment contacts to minimize artifacts. For seismic imaging and inversion operations, the chronostratigraphic modeling techniques are able to incorporate different velocity data sources with appropriate geostatistical methods chosen to interpolate along stratigraphy.

### Emerson Geologically-Constrained Velocity Model Solutions

- Velocity models that replicate any kind of structural complexity. Faults are generated simultaneously to ensure perfectly sealed contacts. All horizons are built simultaneously, guaranteeing consistency and no crossing. Automatic gridding of structural models.
- Ability to replicate all types of stratigraphic complexity with appropriate geostatistical methods to propagate properties
- Preservation of all information related to model construction, including a rigorous audit trail

### Emerson Geologically-Constrained Velocity Model Advantages

The powerful combination of chronostratigraphic modeling with disparate velocity data sources empowers Emerson E&P Software Geoscience Services to deliver sealed structural and stratigraphic velocity models with no approximations or compromises. These robust models can be used confidently for regional or local exploration or development objectives.



▲ Chronostratigraphic velocity modeling methods to handle a full range of structural and stratigraphic complexities



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