

Geology and Geophysics: Ever the Twain Shall Meet

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Exploration for hydrocarbons in areas of complex geology is difficult. Geological information may be sparse and seismic imaging poor so it becomes a struggle for explorationists to produce models of the subsurface in which they have confidence. Only by collaboration between the disciplines and sharing our knowledge can we hope to achieve success.

The difficulty of resolving complex structures lies not only in their geology. The production of useful seismic data can be hindered by severe topographical variations, outcropping carbonates, acquisition conditions and parameters, statics issues and lack of reliable velocity information.

Correct seismic imaging of structures in complex geological settings requires prestack depth migration. The key to success in depth imaging is being able to construct the correct velocity model with which to undertake the migration. This requires discussion between data processors and explorationists. Data processors can develop geologically realistic velocity models only by integrating all sources of geophysical and geological data in consultation with the explorationists. Gravity modelling, a less commonly used tool, may be an asset in providing constraints on the geological model.

A further complexity arises in structural domains where sequences of dipping clastic strata overlie hydrocarbon targets. Targets beneath such a sequence will be mispositioned updip if inadequate isotropic velocities are used during processing and thus anisotropic depth migration becomes necessary to position these targets correctly. New work on seismic data showing growth strata is alerting us to a previously unrecognized problem of image shift in the *downdip* direction.

Poorly imaged data and sparse well control impede interpretation. Interpreters need to understand the limitations of the seismic acquisition and processing methods while processors must address the credibility of their velocity models in the geological context. Geology and geophysics must meet. Only by working together and integrating all of our sources of information will we enhance our understanding of, and achieve success in, structurally complex areas.



Observation of complex structures at the surface can help us to understand the problems of imaging with seismic data their counterparts in the subsurface.