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– Review –
Full Wave Form Modeling

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The following contributions illustrate the use of a variety of full wave form modeling techniques.

M. Pohl and M. Karrenbach extend the well-known reflectivity modeling algorithm to allow for wave field selection while maintaining true amplitude relationships. Traditionally the full 3D wave field is computed for a layered earth model. Particular wave fields are selected by modifying intra-layer propagation, while still maintaining correct reflection and transmission coefficients across layer boundaries. Selective wave field seismograms as well as wave field snapshots can be obtained. This modeling tool can be used in isotropic and anisotropic media to produce seismic responses for primary, free surface and interbed multiple reflections and aid in interpreting and inverting complex seismic reflection responses.

S. Laux examines and modifies the reflectivity modeling technique for layered isotropic media, and produces selected wave field responses for a series of realistic subsurface models and for some real well logs with several hundreds of layers. The synthetic selective wave fields are used to examine performance of predictive multiple removal techniques and allow to quantify the error objectively, since the desired response can be directly computed from the subsurface model. This is in contrast to the subjective error measures that are commonly used in multiple removal techniques, which use a biased estimate. The estimate obtained with the selective wave fields is free of assumptions underlying the processing technique to be tested.

M. Karrenbach gives a introduction to finite difference techniques starting at the basics formulations to foster fundamental understanding of techniques. Applications of seismic wave propagation to complex heterogeneous media show the importance of being able to model with acoustic, elastic and visco-elastic anisotropic models and with a variety of source types. Such full wave form modeling can help in survey design, or aid in interpretation of complex reflection responses and processing design decisions.

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