INVERSION

A preliminary study of the shapes of the objective functions as well as convergence tests on synthetic data showed that the two criteria give similar solutions for models involving a small number of parameters. However, when the number of parameters is increased, the criterion of waveform fitting proves to be more robust that the focusing one, whose main advantage is its cost-effectiveness. Nevertheless, the two criteria can be combined in a single process.

We applied our method to real data from a North Sea profile. We began the optimization with the focusing criterion in order to obtain a first estimate of the model. We refined it by switching to the criterion of waveform fitting. We thus automatically obtained a reliable 2D background velocity model as well as an accurate image of the subsurface reflectivity.

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MODELLING I

A NEW METHOD FOR MATCHING STACKED SEISMIC DATA WITH WELL LOG INFORMATION (C-31)

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The objective is to determine whether the conventional synthetic seismogram bears any relation to the stacked trace.

Conventionally in the oil industry, a synthetic seismogram is computed as the response of a plane wave normally incident to a stack of plane horizontal layers. One of the main drawbacks of this method is that no offset dependence in the synthetic seismograms is taken into account. Because the conventional method is far from realistic, we introduce a more realistic method.

Assuming a plane horizontally layered earth model (acoustic or elastic), the point source response is calculated as the superposition of many plane-wave responses. Starting from this and using the reflectivity method, a synthetic seismogram is calculated in the $\omega-p$ domain. Internal multiples, free surface effects, and source- and receiver ghosts are included in the scheme. The synthetic data set is then transformed to the
MODELLING I

$t-x$ domain. Next, conventional data processing steps are applied to this synthetic CMP gather to obtain a single stacked trace. Two questions arise:

1. How does this synthetic seismogram compare with the conventional approach?
2. Is there a one-to-one correlation between this synthetic seismogram and the original well log?

To match seismic reflection data to well logs, two things are absolutely necessary: properly edited well logs and knowledge of the wavelet in the seismic reflection data.

Bearing this in mind, and looking at the results, the conclusion can be drawn so far that the conventional method for calculating a synthetic seismogram originates with an unreal configuration of the source and that the proposed method correctly treats the point source configuration which is appropriate for real data.

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A CONCEPTUAL STUDY OF RANDOM WAVE SCATTERING (C-32)

CLAUDIA KERNER

Seismic processing and forward and inverse modelling are normally based on classical seismology. This implies the propagation of elastic waves through a simplified model of the earth, in which the layering and tectonically caused heterogeneities are described deterministically. However, the earth contains many heterogeneities that can only be described statistically. The effect of these heterogeneities is to produce a random scattered wavefield which must be added to the deterministic field for a realistic description of the elastic energy distribution.

Studies of the forward problem for random media could help to form a picture of the statistical properties of the wavefield and the medium. An understanding of multiple scattering effects in random media is essential, for example, in the analysis of amplitude effects (amplitude-versus-offset effects, bright spots, influence of random caustics on absorption measurements). It may also be useful for the clarification of the underlying concepts of probability calculus which is increasingly used in inverse problem theory.

Our current research adopts a conceptual approach for the model specification. A small number of parameters such as mean values and variances of elastic parameters and spatial autocorrelation functions are used to describe a random medium. We include anisotropy in the statistical concept because random media are suited for a realistic description of the