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ventional techniques require the design of an inverse filter operator using the autocorrelation function of the seismic trace. The adaptive technique described here provides for the updating of the operator simultaneous to the deconvolution of the seismic trace with a simple three-step algorithm. It is shown that for wide sense stationary data the operator converges to the predictive deconvolution operator having the same prediction interval.

Several examples are given showing the application of the adaptive technique to both real and synthetic data. In a very real sense, this approach represents a significant advance in time-varying deconvolution of seismic data.

Experimental Seismic Work in the Canadian Arctic

ROBERT E. COOK

In the Canadian Arctic, geophysical signal and noise data are affected by high-velocity surface layers of permafrost and ice. Experimental programs define the characteristics of such interferences as horizontally traveling noise, ghosting, reverberations, and multiples so that they can be removed at either the data-gathering or processing levels. At the data-gathering level, noises are filtered by source and detector arrays, shot placement, and multifold shooting; and at the processing level by filtering, deconvolution, stacking, velocity, and static corrections.

The knowledge gathered from several experimental programs was used to design the parameters for a short line of high-resolution data.

Spectral Variability in Seismic Noise Measurements and Implications for Geothermal Exploration

ROBERT S. CROSSON AND IAN R. MAYERS

Regional seismic noise measurements in the frequency range 1 to 30 hz have been made in a variety of geologic provinces in Washington State and in the Kalath geothermal region of Oregon. The purpose of the measurements is to increase understanding of the geologic and environmental factors controlling noise spectra, and the relationship of anomalous spectra to geothermal sources.

Results from the Klamath region do not suggest a simple correlation between spectral anomalies and known geothermal anomalies. When obvious environmental factors such as wind and running water have been eliminated, near-surface geology and perhaps topography may play the most important part in controlling spectral shape. For example, pronounced quasi-harmonically related spectral peaks calculated from data obtained in the layered basalt structure of the south central Cascades may be due to body-wave reverberations in surface layers. Geologic and other controls of ground-noise character must be properly understood before noise measurements can be used reliably as an exploration tool.

A Kalman Filter Approach to the Deconvolution of Seismic Signals

NORMAN D. CRUMP

It is common practice to model a reflection seismogram as a convolution of the reflectivity function of the earth and an energy waveform referred to as the seismic wavelet. The objective of the deconvolution technique described here is to extract the reflectivity function from the reflection seismogram.

The most common approach to deconvolution has been the design of inverse filters based on Wiener-filter theory. Some of the disadvantages of the inverse filter approach may be overcome by using a state variable representation of the earth's reflectivity function and the seismic signal generating process. The problem is formulated in discrete state variable form to facilitate digital computer processing of digitized seismic signals. The discrete form of the Kalman filter is then used to generate an estimate of the reflectivity function. The principal advantages of this technique are its capability for handling continually time-varying models, its adaptability to a large class of models, its suitability for either single- or multichannel processing, and its potentially high-resolution capabilities.

Examples based on both synthetic and field seismic data illustrate the feasibility of the method.

Refraction Data from Single-Ended Refraction Profiles

A. B. CUNNINGHAM

Subsurface layer thicknesses and velocities may be obtained from reverse refraction profiles or by special groupings of traces which effectively fabricate synthetic reverse profiles. Especially in offshore areas, and elsewhere, single-ended profiles are normally used for data gathering. This paper will describe a method for determining refraction information directly from these single-ended profiles, thereby eliminating the need for special field procedures or data handling when refraction information is desired. Also, a comparison of the expected errors from this and the conventional method is given. Finally, an example of static corrections derived by applying this method to the first arrivals of ordinary reflection data is shown.

Generalized Ray Theory—A Powerful Tool for Intermediate Range Seismology

C. N. G. DAMPNEY AND G. F. WEST

Generalized ray theory becomes particularly powerful when combined with a two- to three-dimensional transform method and a technique capable of generat-

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