Most field applications are represented by high-speed seismic systems, which are used mainly because of their large data-gathering capability. A relatively new area is borehole logging, where the arithmetic capabilities of the computer can be brought into play because of the rather low data rates.

Use of multitasking (time-sharing) system monitors allows data gathering to proceed simultaneously with merging of data from previous runs, calculation of results, and output to tape and/or display. Modularization of both software and hardware, in conjunction with the capabilities of the multitasking monitor, allows one of several options to be implemented at run time. That is, the same basic system can be used with a variety of logging tools and calculations specific to each type of log.

We have designed a system for borehole position logging which is generally applicable to other logging methods.

Surface Determination of Subsurface Porosity and Pore-Fluid Resistivity; Geothermal Implications

ROBERT B. MCEUEN

Geothermal exploration relies heavily on surface-resistivity soundings. Low-resistivity areas are assumed to correspond to areas having increased temperature in the subsurface. This assumption is only valid for areas in which the pore-fluid salinity and the subsurface porosity-permability relationships maintain fairly constant values.

RESEIS, a unique method which combines the information obtained from resistivity soundings with information from reflection seismic soundings, provides estimates of both porosity and pore-fluid resistivity as functions of depth. The availability of these subsurface parameters greatly enhances the accuracy with which subsurface temperature estimates can be made.

Electrical Resistivity in Geothermal Exploration

TSVI MEIDAV AND JOHN BANWELL

Review of the growing literature on application of electrical methods to geothermal field exploration shows that the method is one of the most useful geophysical techniques in location of potential geothermal reservoirs. In conjunction with other suitable methods, such as temperature gradient, gravity, or geochemistry, the method appears to be capable of providing information on dimensions of geothermal reservoirs.

An analysis of case histories from ten countries shows that almost without exception and regardless of the nature of the host rock, resistivities less than about 5 ohm-m are encountered within the geothermal area.

Evaluation of laboratory studies suggests that the presence of a steam phase within the reservoir should result in very high resistivities within the steam-phase layer. Likewise, the presence of a cap layer would be expected to generate a high-resistivity layer within an otherwise low-resistivity section. This theory might satisfactorily resolve the apparent problem of explaining the occurence of high-resistivity zones in areas which have been found quite promising by recourse to other methods.

Reflection Seismic on Sea Ice

R. K. MERRITT AND P. CARROLL

Part I—Sea-Ice Noise Measurements and Reflection Results

Results of noise spread studies and reflection recordings made during the 1971 and 1972 winter seasons in the Parry and Sverdrup groups of the Canadian Arctic Archipelago are presented. High-amplitude noise trains were found to obscure the recording of reflection signals on sea ice. Charge size, depth of shot, pattern charges, offset distance, and multiple geophone configurations were varied to obtain an optimum technique in each area. This resulted in the acquisition of usable seismic data from standard types of spread and shot patterns on the sea ice.

Part II—Analysis of Noise-Spread Studies

The noise spread studies mentioned in Part I of this paper are analyzed in detail. In particular the effects due to bubble pulse excitation, flexure waves, and trapped waves in both the ice and water layers are identified and discussed. Spectra of ice noise generated in close proximity to the shot and their variations with ice thickness and water depth are presented. These were found to have relatively constant amplitude components over the area studied.

A Gilbert-Backus Approach to Inversion of Nonlinear Refraction Seismic Data

PAUL MICHAELS, ROBERT M. OTIS, AND JISOO RYU

Vector ray-tracing formulation and Gilbert-Backus inversion approach are adapted for two-dimensional inverse refraction seismology where velocity distribution and geometric parameters of a model are recovered from a measured traveltime versus distance plot. Quadratic interfaces are included in the forward solution, since the assumption of linear interfaces may lead to errors in interpretation. Such a case occurs when the length of the spread is on the order of the size of the structure such that the approximation of flat dipping beds is no longer possible or compatible with station spacing. In computing a system matrix required time partials with respect to model parameters are obtained by a numerical method. Two case