Processing for stratigraphic objectives*

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Stratigraphic objectives require careful attention beginning with acquisition and continuing throughout the processing sequence. This paper reviews some of the fundamental aspects of processing that ensure the data for stratigraphic interpretation and modeling is the best possible representation of the subsurface. To be successfully inverted and accurately interpreted, the data must be as free of noise and multiples as possible, contain as broad a range of frequencies as possible, and reflect true amplitude relationships. Appropriate geophone array and geophone interval values make certain that the higher frequencies are recorded unambiguously. Complete and correct system signature, and predictive deconvolution ensure that the data stacks in phase and closely resembles the earth. Velocity spectra must adequately sample the lithologic and structural variations along the line and be interpreted before and after statics corrections for the best resolution. Furthermore, statics and amplitude adjustments must be surface-consistent so that time and amplitude variations truly represent the subsurface. Wave equation migration maintains the amplitude and frequency relationships in the data while correcting the spatial relationships of dipping and faulted reflectors. When these considerations are properly addressed, stratigraphic interpretation and related studies such as trace inversion and modeling will add meaningful information to the explorationists' picture of the earth's lithology.

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A review of reflection seismic prospecting in the Denison Trough, Bowen Basin, 1960-82*

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Within the Permo-Triassic sediments of the Denison Trough, two generally thick and continuous coal sequences, from close to the top of the Upper Permian and near the top of the Lower Permian, provide ideal acoustic impedance contrasts for reflection seismic techniques. Consequently, within the state of the art, data quality of recordings have generally been considered to be fair to good over most of the area.

The first seismic recordings were made in the early 1960s using single-fold coverage, analog instrumentation and with, in many instances, the only permanent record of the data being the original paper records. These surveys were, however, sufficient to outline the structural attitude of the Denison Trough. With the advent of recording onto magnetic tape, multifold common depth point techniques, and computer data processing, beds other than the coal sequences were able to be identified. Modern, high-effort seismic methods, using digitally recorded and processed data with micro-chip technology, appear to be capable of providing direct detection of hydrocarbons. In addition, they provide a useful guide to the stratigraphy and depositional environments of the sands.

Examples of seismic sections from 1960 to 1982 are discussed together with the latest techniques being employed. Seismic and well data from the Rolleston and the recently discovered Merivale Gas Fields are used in the examples.

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Seismic exploration problems in the Bass region – some recent results

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The diversity of geological regimes in the Bass region, the location of a recent Bureau of Mineral Resources (BMR) seismic survey (Fig. 1), is paralleled by a diversity of seismic exploration problems. Within the Bass Basin the economically significant lower part of the Eastern View Coal Measures, and deeper undrilled strata, have historically been difficult to explore seismically due to acoustic shadowing by, and multiple generation within, the coal-bearing upper part. Furthermore, the overlying section is host to volcanogenic complexes which can be efficient acoustic scatterers. The seismic response of sedimentary sequences in the two continental slopes that were traversed, the upper parts of which are potentially of economic significance, can be partly degraded by a strong water-layer multiple, and by processing flows which fail to compensate for departure from Common Depth Point (CDP) ray path geometry below the rough submarine topography. Limitations of resolution (loss of high frequencies and low signal to noise ratios) in some older seismic data can be related to the practice of summing adjacent traces or consecutive shot records, and to an inadequate energy source (Figs 2 and 3)

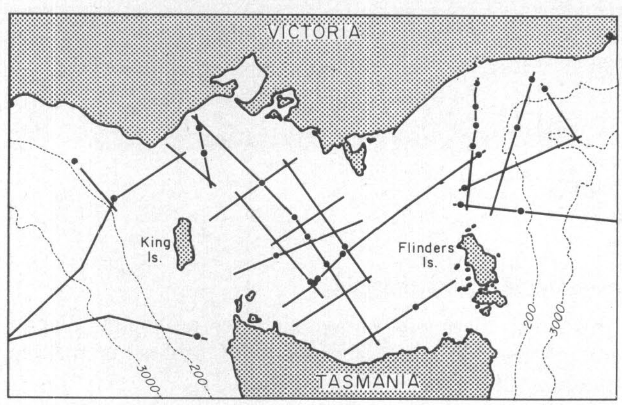

FIGURE 1
Location of seismic survey.