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REPLY TO J. VIDALE'S "COMMENT ON 'A COMPARISON OF FINITE-DIFFERENCE AND FOURIER METHOD CALCULATIONS OF SYNTHETIC SEISMOGRAMS'"

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We wish to thank Dr. Vidale for his comment concerning the fourth-order finite-difference comparison used in our paper. He noted that our choice in using the implicit, fourth-order finite-difference method from McKee (1973) was not the most suited for comparison with the Fourier method in computational efficiency. Our choice in using the implicit method for comparison admittedly stemmed primarily from the familiarity of the method by one of us in Master's thesis research (Daudt, 1983).

The CPU time and storage comparison histograms of Figure 12 (Daudt *et al.*, 1989) were not used to state that the Fourier method is unequivocally faster and less memory intensive than any finite-difference method. Rather, we were attempting to study the utility of the methods, in particular, the Fourier method, through actual run-time comparisons, using equivalent accuracy, of two-dimensional calculations on a scalar, mainframe computer. For example, papers by Dablain (1986) and Fornberg (1987) both reported comparisons between higher-order finite-difference and Fourier methods, Dablain primarily focusing on the effects of using higher-order difference operators and Fornberg emphasizing the reduced grid size of the pseudo-spectral (Fourier) method. We felt that the findings of both papers would benefit from the comparisons performed in our paper. The run-time comparisons might vary somewhat, dependent upon the efficiency of computer coding between methods and the computer used for calculations. Nevertheless, we believe the comparisons serve to strengthen the notion that both the fourth-order finite-difference and Fourier methods are viable alternatives for calculating synthetic seismograms for two-dimensional heterogeneous models.

Daudt *et al.* (1989) focused on the acoustic-wave equation. Our recent efforts have shifted to working with the elastic-wave equation, working with the Fourier method as well as the fourth-order finite-difference method described by Levander (1988). In the case of elastic wave propagation and heterogeneous models, establishing equivalent accuracy criteria for comparison between methods becomes more difficult. Actual run-time comparisons between methods at equivalent accuracy are desirable for comparing methods. We believe that future studies for both methods will be concerned not only with their computational efficiency, but also with the appropriate handling of discontinuous interfaces, implementation of source functions, and the successful application of free-surface and absorbing boundary conditions.

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