

TRUE AMPLITUDE INVERSE WAVEFIELD EXTRAPOLATION. PART II:
APPLICATION IN REDATUMING (C-35)

G. L. PEELS, C. P. A. WAPENAAR AND A. J. BERKHOUT

In areas with a structurally complicated geology the seismic response of the target zone may become seriously distorted because of overburden propagation effects. The hyperbolic moveout assumption is no longer valid so the CMP stacking process will result in a low-quality zero offset section. Full pre-stack migration, on the other hand, may give a high-quality image but is not very efficient, particularly when the target zone is small with respect to the total imaged area. With a redatuming procedure a high-quality seismic section over the target may be constructed in an efficient way. In the redatuming procedure the propagation effects of the overburden are eliminated for both downgoing and upgoing wavefields by inverse wavefield extrapolation. For reasons of computational efficiency and robustness an integral type one-way wavefield extrapolation operator is chosen; hence multiply reflected waves are neglected. From the Kirchhoff integral we derived a true amplitude inverse extrapolation operator (see also part I). In the case of strong reflectors in the overburden the transmission effects may significantly vary laterally. These transmission effects are elegantly taken into account by our inverse operators. The objective of redatuming is to construct a genuine zero-offset section or a set of common shot records at the new datum. Our redatuming procedure, which is carried out per shot record, involves the following steps:

- (1) True amplitude inverse extrapolation of the detected upgoing wavefield from the data acquisition surface to the new datum.
- (2) True amplitude inverse extrapolation of the downgoing source wavefield from the data acquisition surface to the new datum.
- (3) Combination of inverse extrapolated wavefields at the new datum.
- (4) Selection of output traces (ZO section, shot records, etc.) at the new datum.

Since the whole procedure involves processing per seismic shot record, the data management is very simple. Yet, provided that the underlying assumptions are valid, the only approximation in our redatuming approach is the negligence of evanescent waves and multiply reflected waves. Both amplitude and phase of propagating primary waves are properly handled. This is particularly of interest when lithological information of the target zone is to be extracted from redatumed primary data.

Delft University of Technology, Laboratory of Seismics and Acoustics, PO Box 5046, 2600 GA Delft, The Netherlands.

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