# Multiple Attenuation Using MultiFocusing Technology

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## Abstract

The removal of multiples energy on seismic data has been a major issue on many datasets worldwide. The primary advantage of MultiFocusing (MF) is the enhancement of the signal-to-noise ratio of both stacked sections and prestack data through stacking a much larger number of traces than in conventional CMP processing. We present a modification of the MF-based approach when multiples are recognized directly in the MF attribute domain. First, they are predicted according to MF wavefront parameters and then they are subtracted using an adaptive least squares method.

The key elements of the proposed procedure are the MF attributes. We identify and predict the multiples in the MF attribute domain through interpretation of the RMS velocity and emergence angle panels, which are determined from the pre-stack data during the MF multidimensional analysis.

We then calculated the offset traveltimes for the multiples using the identified MF attributes and compute a multiple model based on the partial coherent summation of the original data along the predicted traveltime surfaces. For the final stage, we adaptively subtract the predicted multiples from the original data using a least squares adaptive subtraction procedure similar to SRME-type multiple attenuation methodology.

We presented a multiple attenuation methodology using MF applied on a real data example. The discussed procedure is valid and robust for surface-related multiples. Interbed multiples can also accurately be removed by this technology when they can be differentiated according to either RMS velocity or dip angle.

## References Cited

Berkovitch, A., Gelchinsky, B., and Keydar, S., 1994. Basic Formula for MultiFocusing Stack, 56th EAGE Conference and Exhibition. Expanded Abstracts.

Berkovitch, A., Belfer, I., and Landa, E., 2008. Multifocusing as a method of improving subsurface imaging, The Leading Edge, 2, 250-256.

Gelchinsky, B., 1988. The common-reflecting-element (CRE) method (non-uniform asymmetric multifold system): Expl. Geoph., 19, 71–75.

Hampson, D., 1986. Inverse velocity stacking for multiple elimination: J. Can. Soc. Expl. Geophys., 22, 44-55.

Keydar, S., Landa, E., Gelchinsky, B., and Belfer, I., 1998. Multiple predictions using the homeomorphic imaging technique: Geophysical Prospecting, 46,423-440.

Landa, E., Keydar, S. and Belfer, I., 1999. Multiple prediction and attenuation using wavefront characteristics of multiplegenerating primaries. The Leading Edge 18 (1), 60-–64.

Landa, E., Belfer, I., Keydar, S., 1999. Multiple attenuation in the parabolic $\tau$ - $p$ domain using wavefront characteristics of multiple generating primaries. Geophysics, 64, 1806-1815.

Landa E., Keydar, S., and Moser, T.J. 2010. MultiFocusing revisited - inhomogeneous media and curved interfaces. Geophysical Prospecting, 58, 925–938.

Weglein, A., Shin-Ying Hsu, Terenghi, P., Xu Li, and Stolt, R., 2011. Multiple attenuation: recent advances and the road ahead [2011]. The Leading Edge, 8, 864-875.

Yilmaz, O. 2001. Seismic data analysis. SEG publication, vol 2, p. 956.