Multiple Removal & Noise Attenuation

Spectrum is able to offer its clients a wide range of noise attenuation and demultiple solutions to help resolve the various random and coherent noise issues presented. Our multiple removal techniques are based on the principles of ‘modelling the multiples’ and ‘modelling the primaries’ to ensure comprehensive noise suppression of your data.

High Resolution Radon

Efficient high resolution Radon modules are available which work in the Fourier domain. These programs use weights to focus the decomposition onto its most significant spectral components. The weights are obtained by using the radon spectrum obtained from the previous frequency. A scalar is used to introduce a viscosity, which prevents undesired variations caused by random noise.

Radon is used:
- when SRME assumptions fail
- when primaries and multiples are differentiated based on parabolic moveout
- for water bottom and interbed multiples
- to attenuate residual multiple after SRME

Tau-p Deconvolution

In the application of Tau-p deconvolution Spectrum’s geophysicists understand that multiples are only truly periodic in the X-T domain at zero offset, so pre-stack deconvolution is of limited use as a multiple attenuator. By transforming data into the linear Tau-p domain, multiples can be made periodic for all values of P and effectively attenuated with predictive deconvolution. This technique is particularly effective in shallow water areas where muting in the tau-p domain can assist with linear noise attenuation.

Surface Related Multiple

Our Surface Related Multiple Elimination (SRME) program is an ‘autoconvolutional process’ based on the published work of Verschuur & Berkhout (1997); Spectrum is also a member of the Delft consortium.

The removal of surface related multiples is an essential processing step before pre-stack time migration and requires no independent knowledge of the structure being imaged.

Swell Noise

Swell noise is often reduced with a simple low cut filter. However Spectrum uses an amplitude-friendly proprietary module called NOISERM. This module performs frequency dependent noise removal which can achieve attenuation of swell noise. NOISERM is able to isolate spectral outliers using fast short windows FFT’s, ideal for any type of spatially variant incoherent noise.
Spectrum’s proprietary targeted multiple attenuation technique is useful in instances where there is little or no velocity separation between the multiple and primary trends. In these cases traditional methods such as F/K and Radon are often ineffective. It also works well in situations where multiple aliasing occurs. The process may be parameterised to be spatially and temporally variant.

Refine is a proprietary, amplitude-friendly high frequency enhancement process. It is used to boost data frequencies without a corresponding increase in noise. The resultant seismic data contains frequencies much higher than that associated with conventional seismic, and an increased effective seismic bandwidth for improving signal-noise ratios and enhancing the stability of seismic inversion for rock property analysis.