Multiple suppression by the CRS technique

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Multiple suppression generally relies on the filtering of multiples if their kinematic behaviour significantly deviates from the traveltimes of primaries. Otherwise, multiple prediction and subtraction may be appropriate, using information either from a subsurface model, or from seismic data attributes. Such information is required in the case of land data, where high-velocity rocks may be present up to the surface, leading to a similar kinematic behaviour of primary and multiple reflections. That information is required in high accuracy and detail since the multiple generating interfaces cannot be assumed to be perfectly flat and uniform, and moreover the multiples are further obscured by near-surface effects, i.e., velocity variations and ground roll noise.

Very detailed information on the kinematic characteristics of seismic data is provided by the Common-Reflection-Surface, or CRS imaging technique. At each point of the image, this technique derives a locally adapted traveltime approximation. The corresponding local imaging parameters, i.e., the CRS attributes, comprise surface related incidence angles and wavefront curvatures that may well be used to identify and model multiple arrivals.

The multiple reflections can be identified by their behaviour in the CRS attribute domains. For this task, three CRS attributes are available from 2D data, and eight attributes from 3D data. The CRS traveltime approximation is then used to model the multiple arrivals in the prestack data around the considered image location. Since the CRS traveltime approximation is valid beyond the image CMP location where the multiple was identified, the multiple can be suppressed at the surrounding CMP locations as well, without additional identification efforts.