Improved AVO analysis based on the CRS method

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The Common-Reflection-Surface (CRS) method which was developed in recent years, has increasingly been used for the high resolution imaging of complex subsurface structures. Assuming subsurface reflector elements with dip and curvature, the CRS method renders a better signal-to-noise ratio and additional subsurface information in comparison to conventional NMO/DMO time domain imaging. These advantages of the CRS method, however, may as well be used for an improved Amplitude Versus Offset (AVO) analysis. A conceptual case study shows that the more realistic subsurface assumptions, and the increased fold of the CRS imaging, allow to extend AVO analysis into noise zones. The signal-to-noise ratio of the CRS AVO gradient stack is much higher than in conventional AVO. Extreme fluctuation of AVO parameters is removed, and AVO anomalies are enhanced. In the case study, the CRS AVO gradient stack clearly distinguishes an anomaly at a known gas bearing reservoir. Small anomalies above the reservoir disappear, indicating that they were due to local noise contamination. Cross plots of the AVO intercept versus gradient show a better separation of anomalous zones which may be classified in order to identify top and base of hydrocarbon deposits. Based on the local CRS imaging solution, the general increase of the signal-to-noise ratio imply an improved AVO analysis by CRS for many types of data. Large benefits of CRS AVO is especially expected in areas of strong dip, and at deep targets with a low signal-to-noise ratio.