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Application of Partial Crs-Stack Method to Enhance Gas Reservoir Characterization in a Complex Geological Structure: Synthetic Case Study

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The application of Partial CRS-Stack method is presented in this paper. This method is introduced in 2009 and proved as an alternative method that can produce excellent subsurface image. Similar to CRS-Stack method that is developed previously, the Partial CRS-Stack has advantage, especially when this method is applied to a seismic data that is acquired from an area with complex subsurface structures, in which the results from conventional stacking method cannot fulfill the interpreter needs. Besides that, the additional significant advantage of Partial CRS-Stack is its ability in providing more traces in the resulted CDP supergathers. The characterization of gas reservoir can theoretically be done more easily and clearly if it is conducted in the CDP supergather rather than normal CDP gather. Later, the velocity analysis can also be conducted from those CDP supergathers, which will result better approximation of stacking velocity of subsurface.

The Partial CRS-stack method is tested by using a synthetic seismic dataset, which was made from a complex geological structure model that contains a gas reservoir. Since Partial CRS-Stack method uses the information of reflectors along Fresnel zone, instead conventional method that only uses information in a CDP, the stacked section resulted from Partial CRS-stack is much better than the result of conventional one. During its calculation, CRS kinematic wavefield attributes, e.g. emergence angle (α), radius curvature of normal ray (RN) and radius curvature of normal incident point ray (RNIP) must be determined previously, which indicates the location and behavior of reflectors.

With an assumption that the CRS Supergather is a preserved amplitude data (after Baykulov, 2008), we would like to prove its ability in conducting gas reservoir characterization by applying this method to synthetic dataset, e.g. by conducting cross product analysis. Cross product analysis is a convolution operation between intercept and gradient, which will have positive value in gas reservoir area. Since the quality of the seismic data increases, the results of cross product analysis could show the occurrence of gas in a better way. The positive value of the cross product can be seen clearly and stronger if the CRS supergather is used, thus the bound of the reservoir could be identified more clearly.

As a conclusion, the Partial CRS-stack method is proved as a good alternative method to give better seismic sections. Because of this, the interpretation of unclear events that are seen in the conventional stack section can be avoided and also it can enhance the analysis of gas reservoir characterization.