Seismic Attribute-Based Characterization Of A Prolific Coalbed Methane Reservoir

Iván D. Marroquín* and Bruce S. Hart
Earth Planetary Science, McGill University,
3450 University Street, Montreal, QC, H3A 2A7
itlalotl@eps.mcgill.ca

ABSTRACT

Coalbed methane production is a function of various factors including coal thickness and fracture/cleat density. In this study, we integrated P-wave 3-D seismic and well data to investigate a thick, continuous coal seam in the lower part of the Fruitland Formation of the San Juan Basin. Our objective was to show the potential of using 3-D seismic data to predict coal thickness, as well as the distribution and orientation of subtle structures that may be associated with enhanced permeability zones. To do this, we first derived a model that predicts coal thickness by using a multiattribute-based analysis. Despite the small improvement of the correlation coefficient when all the terms composing the predicted model are used (e.g., $R^2 = 0.87$) in comparison with using only the first attribute (e.g., $R^2 = 0.84$), we demonstrated that multiattribute approach, below tuning thickness, provides better estimates of the true bed thickness than could have been achieved with any single attribute. Thereafter, we used curvature attributes to track subtle features that are not clearly evident on vertical transects or seismic slices. By using rose diagrams and a juxtaposition approach, we sought to discriminate between true curvature lineaments and map generation/acquisition artifacts. Analysis of dominant production trends revealed a strong association between coal thickness, structural features, and high productivity. Accordingly, the incorporation of curvature lineaments and production data strengthened to our attribute-based interpretation.