Seismic Attribute Analysis for Coal-Bed Methane Detection in the Fort Union Formation, Sweet Water County, Wyoming

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In the search to increase reserves of natural gas, seismicattribute analysis has become a standard analysis tool for reservoir characterization. However, no known studies have used seismic attribute analysis for coal-bed methane detection. Instead, the majority of gas studies have focused on detecting natural gas in tight gas sands.

The Fort Union Formation of the northern Green River Basin in Wyoming contains coal seams bearing coal-bed methane (CBM) that are difficult to detect on seismic sections. The ancient western interior seaway existed through Wyoming and in it were deposited sediments that contained hydrocarbons and intermittent coal seams. In 1998/1999, a 3D seismic survey was collected by CGGVeritas in west central Wyoming intended for interpreting formations beneath the Fort Union. These data became available to perform a feasibility study to determine if CBM could be detected through its seismic response. Well information was not provided for the study site; however, we obtained well information for 17 wells from the Wyoming Oil and Gas Conservation Commission. We calculated synthetic seismograms for 13 wells from hand-digitized sonic logs and used constant density values of one due to a shortage of densitylog information. Driller's cuttings logs were used to guide the interpretation of the coal seams. In addition, gas zones were identified within the well bores from the well log total gas curves. From the available data, we were only able to come up with two zones containing both coal and gas.

We will use these two calibration points to test neural network scenarios in an attempt to map seismic attributes to locations expected to contain CBM. Single attributes or combinations of attributes will be used as inputs into a back propagation neural network trained to predict the presence of coal and gas on the seismic for the calibration points. The trained network will then be used with the chosen attributes to predict the presence of CBM over the entire survey area.