UNIVERSITY of HOUSTON

ALLIED GEOPHYSICAL LABORATORIES

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Research Interests: Quantitative Interpretation, Well Log Data Analysis, and 3C Seismic Data Analysis and Inversion.

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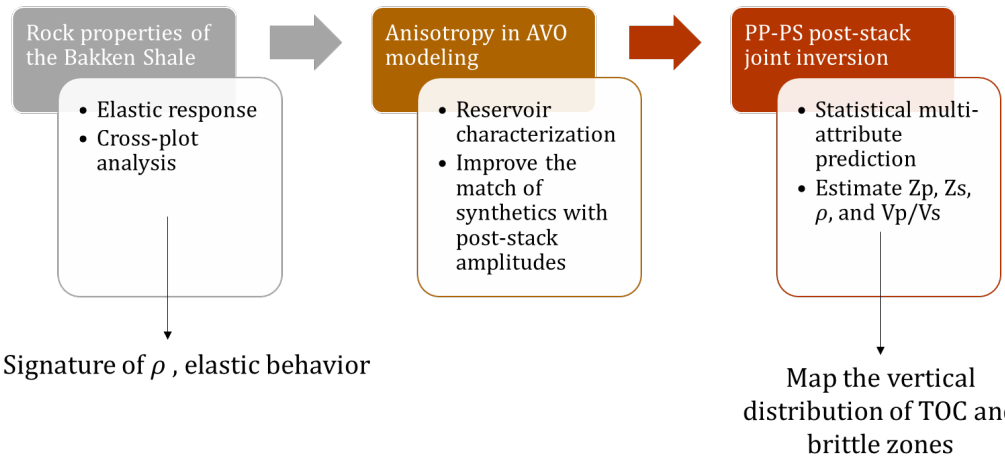
Abstract

A major goal of the applied seismic analysis is to understand and predict the seismic response of rock properties from variations of the seismic amplitude. To evaluate the amplitude behavior, different forward modeling processes and comparison techniques may be explored in the oil and gas industry, especially currently with the advent of modern oil production from shales through horizontal drilling and hydraulic fracturing. Therefore, petrophysical and rock-physics analysis for understanding the relationship between rock properties and the elastic response, the evaluation of the AVO response for the anisotropic case, model-based estimations, and statistical predictions of P-impedance, density, Vp/Vs, TOC, and shale brittleness are interesting topics that motivate some of our studies in AGL. In the special case of the Bakken resource play which accounts for almost 16.5% of the entire U.S. oil production (1,389 Mbd in August 2019), is the second in terms of oil production after The Permian play, and has a production expected to rise in September 2019 (EIA Drilling productivity report, August 2019), better techniques are employed to assess variations in reservoir and data quality. Hence, due to the small thickness of its inner members and the lack of high frequency multicomponent seismic data, the characterization and location of the best areas to produce hydrocarbon from this shale play are still subject of study and will support its viability for the future. In AGL, we are aimed to investigate the rock properties of the Bakken shale and how they relate to the elastic response. The cross-plot analysis has been carried out with the main purpose of finding a signature of the density and elastic behavior of the unconventional reservoir of interest. Furthermore, the effect of anisotropy in AVO modeling has been taking into account in an attempt to aid the reservoir characterization of the Bakken Shale from surface seismic, well logs, and a PP-PS joint inversion followed by a statistical multi-attribute prediction process were conducted to estimate P-impedance, S-impedance, density, and Vp/Vs and to map the vertical distribution of TOC and brittle facies within the thin Bakken members.



Rock properties, AVO seismic modeling, and 3C seismic data analysis workflow applied to the study of the exploration potential in the Bakken Shale, North Dakota.