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Practical Seismic Petrophysics: The Effective Use of Log Data for Seismic Analysis

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The conditioning and analysis of log data for quantitative seismic interpretation is often simply categorized as “rock physics.” Unfortunately, rock physics workflows often overlook or oversimplify the proper editing and interpretation of log data, the result of which can be unrealistic expectations and interpretations of seismic amplitude responses. The more encompassing phrase “seismic petrophysics” better describes the necessary linkage between petrophysics and rock physics. Seismic petrophysics not only includes rock physics, but also includes the proper conditioning and interpretation of log data that should occur prior to the application of rock physics and seismic models. This is especially true in conditioning log data for shearwave velocity estimation, fluid substitution calculations, and AVO modeling.

This talk will focus on the important role of “seismic petrophysics” in the quest to extract additional information from subtle seismic responses. Topics covered will include various aspects of log editing, petrophysical interpretation (including integration of other data sources—core, fluids, pressures, etc.), and some common pitfalls associated with the “workhorses” of rock physics (invasion corrections, shear velocity estimation, and elements of fluid substitution). It is important to recognize that log data should not simply be recomputed to fit prior expectations as defined by a rock physics model. Instead, rock physics models should be used as templates, which allow the interpreter to better understand the underlying physics of observed log responses and how they are governed by local petrophysical properties. Case studies will be used to reinforce critical concepts.

Biography

Tad Smith is senior technical advisor for petrophysics and seismic rock properties at Apache Corporation. Prior to joining Apache, Tad held a variety of positions as a geologist and petrophysicist at various companies, including Amoco, BP, Newfield Exploration, VeritasDGC, CGGVeritas, and ConocoPhillips. In 1995 – 1996, he participated in the Amoco Petrophysics Training program, where he developed a keen interest in petrophysics and seismic rock properties (“seismic petrophysics”). He has been actively engaged in the process of integrating petrophysical data into geophysical work-flows ever since. Tad has a PhD in geology from Texas A&M University, and is a member of SEG, AAPG, SPWLA, SPE, GSH, and the HGS. When he’s not working on interesting petrophysical problems, he enjoys time with his wife and son, riding bikes, spending time with good friends, and listening to good music.