**Back to the Future of Wireline Log Normalization using a Geologic Trend-Based Approach: Examples from Western Canada, the US Rocky Mountains, and The Permian Basin of West Texas**

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Evaluation of large-scale resource plays often involves thousands of wells, covering a span of

hundreds of miles. Proper characterization requires extremely accurate well logs. For this reason

log normalization continues to be one of the most important ‘first steps’ in accurate petrophysical

evaluation and basin modelling. However, log normalization is often under-appreciated, treated

as an enigmatic “black box” workflow, or simply avoided altogether. Even less appreciated or

understood is a regional trend-based approach like those pioneered by Doveton and Bornemann

(1981) and Kane, et al. (2005).

In this presentation we address the necessity of accurate log normalization, discuss the various methods available, and present a simple workflow for regional trend-based normalization that can be performed on most standard mapping software platforms. The basis of the method is similar to traditional wireline log normalization but takes it a step further by integrating a regionally derived geological trend surface. This novel approach accounts for regional variations in facies, compaction, diagenesis, and man-made variations including log vintage, mud type, and other time-dependent trends.

This specific workflow has been successfully implemented in multiple basins across the United States and Canada including the Midland, Delaware, San Juan, Powder River, DJ, Uinta, Green River, Paradox, Williston, and Western Canada Sedimentary Basins. In this talk we present the workflow in detail using an example from the Powder River Basin of Wyoming, then present numerous smaller case studies from other basins, highlighting specific challenges and solutions for different rock types, structural and stratigraphic settings, and data vintages. The numerous case studies were not included in the original presentation of the workflow shown at the 2019 RMS-AAPG, and 2020 RMAG luncheon.

This simple approach allows a user to normalize a large set of wells in little time, while accounting for regional geologic variations otherwise ignored by traditional normalization workflows.

**References Cited**

Doveton J.H., and E. Bornemann, 1981, Log normalization by trend surface analysis: The Log Analyst, v. 22/4, p. 3-8.

Kane, J.A., and J.W. Jennings Jr., 2005, A Method To Normalize Log Data by Calibration to Large-Scale Data Trends: Presented at the SPE Annual Technical Conference and Exhibition, Dallas, Texas, October 9-12, SPE-96091-MS. <http://dx.doi.org/10.2118/96091-MS>.

**Bio**

Mark Millard is a Geoscience Manager at Rockies Resources LLC. He has over 15 years of experience in nearly every basin in the Rockies and Texas. He has worked in a multitude of roles from frontier exploration through field development for private PE backed and large public companies. Mark is the author of over 30 papers and/or technical presentations. He currently serves on the Geology Advisory Board for BYU-Idaho, and was previously the President of the Montana Geological Society, and Technical Session Chair for the 2017 RMS-AAPG Annual Conference. He received the A.I. Levorson Award from the RMS AAPG, and the Frank Kottlowski Memorial award from the AAPG Energy and Minerals Division in 2014.

He received his Master’s degree from Baylor University in 2007, and Undergraduate degree from BYU-Idaho in 2005 (Cum Laude). His interests outside of geology include building mandolins, guitars, and violins, playing bluegrass music, and ice hockey.