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Brushy Canyon "Redux": Digital outcrop models synthesize legacy and new outcrop data for conventional & unconventional reservoirs, saltwater disposal, and for training the next generation of geoscientists

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The future of the energy industry relies on understanding increasingly complex geological settings, and geoscientists must be able to think in three (and sometimes four) dimensions to better interrogate the subsurface. While nothing replaces learning from real outcrops, digital outcrop models offer a powerful solution that provides immersive and accessible 3D geological data and context that help build spatial-reasoning and critical-thinking skills necessary to interpret sparse subsurface data. Where these models truly excel is the spatial and geological bridge that they provide between small- (i.e., thin section) and large-scale (i.e. seismic) data that are hard to visualize in the field alone. Yet, few training resources focus on translating detailed digital-outcrop geology to the data-sparse subsurface.

This study focuses on world-class outcrop and subsurface data from the Delaware Mountain Group of the Permian Basin, Texas, relevant for conventional and unconventional reservoirs, saltwater disposal, and emerging industry applications. (e.g., CCUS). Legacy data from extensive outcrop-based fieldwork is being migrated into georeferenced and modern digital frameworks (e.g., VRGS, Petrel), and integrated with newly collected drone-based photogrammetry, lidar, and targeted fieldwork that focuses on siltstone and organic-rich-siltstone facies in proximal locales that were not previously studied in detail. The integrated dataset enables improved stratigraphic correlation between localities, refinement of existing facies mapping, and quantitative characterization of stratigraphic architecture at scales ranging from event beds to channel complexes. These workflows demonstrate that digital outcrop data, supported by the rocks as a grounding force, is an important tool for training the next generation of geoscientists to better interpret and predict reservoir heterogeneity in the subsurface.

Biography

Zane Jobe is a sedimentologist and research professor at Colorado School of Mines. His work focuses on using outcrop analogs to improve prediction of subsurface fluid flow. He aims to better understand the stratigraphic architecture, scaling relationships, and sediment budgets for clastic depositional systems, with an emphasis on submarine environments. He uses outcrop analogs, core, subsurface datasets, and modern-seafloor observations to improve prediction of reservoir architecture, heterogeneity, and fluid flow.

Zane also leads industry-focused field trips for integrated teams (e.g., geology, geophysics, petrophysics, reservoir engineers, production engineers, facilities) to outcropping deep-water deposits that are highly relevant for producing assets in the GoM, west Africa, and South America, including:

- Southern California
- Permian Basin, Texas
- County Clare, Ireland
- Magallanes Basin, Chile

He also enjoys cycling in the summer and driveway snow removal in the winter.