

Cracks in the Foundation: Basement Influences on Reservoir Development

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ABSTRACT

Basement structures are sometimes conjectured to have had an influence on depositional patterns and processes in the overlying sedimentary section. Post-depositional reactivation of basement structures can induce fracturing and faulting that can influence reservoir performance directly or by controlling diagenetic processes. Examples from the Alberta Basin, San Juan Basin, Permian Basin and elsewhere illustrate a variety of approaches to identifying basement influences on reservoir development. Log-based methods (cross-sections, maps, etc.) may be suggestive, especially where depositional and/or erosional trends correspond at multiple stratigraphic levels, but deep well control is seldom adequate for mapping basement features. Furthermore, deposition and erosion may also be influenced by relief associated with carbonate buildups, unconformities, depositional shelf breaks and other features within the sedimentary column itself. Seismic data, in particular 3-D seismic data, are commonly helpful. Various techniques are useful for identifying structural features that affect basement. In cases where basement does not correspond to a mappable reflection, “near-basement proxies” are sometimes used to identify basement structures. Two-dimensional seismic data may be used to identify major structures and trends, but can miss minor features and structural trends derived from these data may not be correct. In any seismic study, velocity artifacts (e.g., statics busts) may seriously distort true basement structure and so time-structure maps need to be examined with caution. Potential field data (e.g., aeromagnetic, gravity) are capable of “seeing” basement features, but do not provide high-resolution information about features in the overlying stratigraphic column. Integration of various data types is essential to success.