Weld Classification — Not Just for Salt and Faults Anymore

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ABSTRACT

Welds are structural/stratigraphic elements which record the juxtaposition of formerly separated geologic units, and are generally associated with the dissolution and/or flowage of evaporites, especially halite, commonly in association with faulting. Their importance within salt-related petroleum systems, including the Gulf of Mexico basin, is well established. However, unit juxtaposition occurs in many additional geologic environments and thus represents a more diverse class of welds.

Many of these welds are important for respective petroleum systems. For example, stylolites form by pressure dissolution of carbonates and less commonly quartz sandstones, and collectively can result in significant loss of reservoir quality rock while imparting permeability anisotropy due to impermeable (or less permeable) residue on the stylolite seam. On the positive side, however, stylolite teeth record the orientation of maximum compressive stress, and thus represent an important factor for understanding overall structural development. As another example, welds may also form from shale flowage during folding and resultant transfer of material from flank to core (an important factor in fold genesis during transition from parallel to similar folds). Formerly separated reservoir rocks can be placed in contact or near contact, resulting in complex reservoir commingling.

Additionally, welds may form in igneous environments, often exhibiting remarkable similarity to salt systems. As but one example, during intrusion, magma may be injected laterally into adjacent strata as sills, which may be subsequently drawn back into the main stock, similar to lateral injections and subsequent draw back of salt. The magma or salt sill initially separates strata during injection, and then following removal of the magma or salt those same strata are placed back into contact, as indicated by thermal or chemical alteration and/or remnant intrusives.