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Origin of Lower Ordovician Ellenburger Group Brecciated and Fractured Reservoirs in West Texas: Paleocave, Thermobaric, Tectonic, or All of the Above?

Several origins have been suggested for the development of breccias and fractures that compose Ellenburger reservoirs. Suggested origins include karst-related paleocave collapse, subsurface thermobaric fracturing, and tectonic fracturing. Actually the brecciation and fracturing in the Ellenburger Group are a combination of all three processes.

The initial brecciation and fracturing are well documented to be associated with cave formation and collapse. The collapse starts at the surface contemporaneous with cavern formation and continues into the subsurface to at least 9,000 ft of burial. Cave formation is evidenced by (1) detrital cave-sediment fill, (2) Upper Ordovician to Mississippian conodonts in the sediment fill, (3) speleothems, and (4) lateral extent of brecciated pods. Paleocave collapse is the origin of most Ellenburger brecciation and fracturing. Boxwork structure and higher temperature baroque dolomite cements are evidence of thermobaric brecciation. Boxwork structure is composed of closely spaced dolomite-filled fractures on the scale of decimeters to millimeters. The host is commonly dissolved, leaving an open boxwork. The baroque dolomite cements passively fill the void spaces created by cave processes. Tectonic fractures cut host rock, lithified breccias, and lithified sediment fill. They have relatively strong directional patterns.

Deciphering the origin of complex breccia and fracture systems is commonly difficult, and the complete paragenesis of a system must be understood. Paleocave systems are conduits in the subsurface for late hydrothermal fluids that may passively precipitate cements. These cements have no relation to the origin of the voids. Tectonic fractures can overprint any system.