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Spatial variations in the salinity of produced waters from southwestern Louisiana

Understanding the controls on the salinity of deep basinal waters is of importance in problems related to fluid flow, wire-line log response, reservoir continuity and compartmentalization, and sediment diagenesis. Chemical analyses of nearly 400 samples of produced waters from a six-parish area of southwestern Louisiana compiled by the U.S. Geological Survey were evaluated to determine potential controls on formation water salinity. The waters were produced from depths of approximately 500 to 4700 m. Salinities range from less than 10 g/L to nearly 350 g/L. The generally low Br/Cl ratios of the more saline produced waters, as documented in other studies, is consistent with salt dome dissolution being one of the major controls on salinity. There is no systematic variation in salinity with depth, although low salinity waters (TDS < 35 g/L) are limited to depths below 2500 m in often overpressured sequences. It is possible that these waters have been diluted by dehydration reactions at temperatures in excess of 100ºC. Salinities derived from SP response generally show a freshening downward into overpressured sediments in southwestern Louisiana. However, many of the overpressured produced waters have high salinities, probably reflecting hydrocarbon accumulation in permeable units near salt structures.