

## **The Niobrara Petroleum System—A Major Tight Resource Play in the Rocky Mountain Region**

Sonnenberg, Steve <sup>\*1</sup> (1) Colorado School of Mines, Golden, CO.

The Niobrara Petroleum System of the U.S. Rocky Mountain Region is a major tight petroleum resource play. The Niobrara is self-sourced and reservoirs are low permeability chinks, shales, and sandstones. Source beds have total organic carbon contents that range from 2 to 8 weight percent. Source beds are thermally mature in the deeper parts of many of the Laramide basins in the Rocky Mountain region. Continuous or pervasive accumulations occur in thermally mature areas.

The Niobrara source rocks are dominantly Type II (sapropelic). Oil accumulations occur where source beds are still in the thermogenic oil window (e.g., Denver Basin). Thermogenic gas accumulations occur where the source beds have entered the gas generating window in deeper parts of basins (e.g., Piceance Basin). Biogenic methane occurs in shallow chalk reservoirs on the east flank of the Western Interior Cretaceous Basin. In addition shallow gas fields are found in northern Montana.

Natural fractures are important in controlling sweet spots in the play and form for several causes. Several models create fractures in the Niobrara and include Laramide tectonics, Neogene extensional tectonics, solution of evaporates, hydrocarbon generation, and regional stress patterns.

The Niobrara is a technology reservoir that requires horizontal drilling and multi-stage hydraulic fracturing. The Niobrara petroleum system is present over most of the Rocky Mountain Region and is prospective in many areas.