CSUR Canadian Society for Unconventional Resources

The power to *Connect*. The power to *Convene*. The power to *Inform*.

April 2020 – Members' Only Technical Webinar

The Sunset Prairie Formation: Summary of a new Middle Triassic formation in Western Canada

Just as individuals, organizations, industries and pretty much all facets of humanity have had to adjust to cope with the current global situation, so has CSUR! To continue with our technical program for the year and to keep our membership engaged, the April instalment of our technical series pivoted to an online format. Carolyn Furlong, Ph.D. from the University of Alberta was on hand to present her thesis work on the Summary of a new Middle Triassic Formation in Western Canada, The Sunset Prairie Formation.

Carolyn's work was primarily based on the B.C. side of the border and involved looking at some 25 cores and 300 wells as part of her study. The subject formation, which had not been studied previously, is wedged in between the Doig Phospate and Montney horizons. A literature search of work done from 1995 to 2019 revealed 22 publications that acknowledged this unconformity bound interval.

In conducting the study, Carolyn outlined the specific process that was established in order to methodically identify the various facies within the Sunset Prairie layer. Specific sedimentological, ichnological and paleontological characteristics were considered in order to establish differences between the Montney, Doig & Sunset Prairie zones. The results from this work were then utilized to ascertain the potential hydrocarbon contribution of the Sunset Prairie layer to wells drilled into the Triassic horizons.

ABSTRACT: The Sunset Prairie Formation is a newly named Middle Triassic formation in the Western Canada Sedimentary Basin and is found mainly in northeastern British Columbia (Furlong et al., 2018a). Sitting above the Montney Formation (one of Canada's most important unconventional reservoir intervals), the Sunset Prairie Formation has the potential to contribute valuable hydrocarbon resources to wells drilled into Triassic horizons. This study incorporates sedimentological and ichnological characteristics of the Sunset Prairie Formation to construct a sequence stratigraphic framework to understand depositional dynamics and basin evolution. All of this is useful for evaluating and predicting reservoir distribution and exploration potential of the Sunset Prairie Formation.

The Sunset Prairie Formation is lithologically, ichnologically and paleontologically distinct from underlying and overlying strata. The formation consists of interbedded light gray, pervasively bioturbated sandstone and dark gray, diminutively

bioturbated to non-bioturbated siltstone. Trace fossils within the unit include Asterosoma, Chondrites, Cylindrichnus, Diplocraterion, Helminthopsis, Palaeophycus, Phycosiphon, Planolites, Rhizocorallium, Rosselia, Scolicia, Skolithos, Teichichnus, Thalassinoides and Zoophycos. Paleontological assemblages include bivalves, gastropods, lingulid brachiopods (which all occur within the Montney and Doig Formations), and spiriferid brachiopods, terebratulid brachiopods, echinoderm spines and crinoid ossicles (which are quintessential components of the Middle Triassic fauna).

Collectively, seven facies were identified and are ascribed to offshore, offshore transition and lower shoreface depositional facies associations (Furlong et al., 2018b). Three shoaling-upward parasequences can be identified through upward increases in grain size (up to very fine-grained sandstone), bioturbation intensity and trace fossil size. Additionally, a Glossifungites-demarcated discontinuity surface and/or conglomeratic lag deposit is observed at the base of each parasequence. The retrogradational stacking pattern of parasequences suggests an increase in relative sea level during deposition. The formation is bound by unconformities. The lower unconformity truncates the underlying Montney Formation. The upper unconformity, at the base of the Doig phosphate zone, truncates the Sunset Prairie Formation and, to the east, incises into the Montney Formation. Two sequence stratigraphic frameworks are proposed for the Sunset Prairie Formation. The first interprets the formation to represent lowstand systems tract during deposition of the lowermost parasequence, which is capped by a maximum regressive surface; the overlying two parasequences represent the transgressive systems tract. The second model interprets the entire formation to represent a transgressive systems tract. Each model has strengths and flaws associated with its interpretation.

Regardless of which model is favoured, the retrogradational nature of the parasequences cause the lowermost parasequence to exhibit the thickest packages (up to 7 meters) of pervasively bioturbated, very-fine grained sandstone. Fine-grained sand content, thickness of coarse-grained beds and bioturbation intensity decrease with each proceeding parasequence. The result of this retrograde stacking pattern and high net to gross sand in the lowermost parasequence produces a "pseudo conventional" reservoir within a dominantly tight sandstone/siltstone interval. Elucidating the sequence stratigraphic architecture allows for better prediction of potential reservoir intervals to optimize hydrocarbon recovery within the Sunset Prairie Formation.

References

Furlong, C.M., Gingras, M.K., Moslow, T. and Zonneveld, J-P. 2018a. The Sunset Prairie Formation: Designation of a new Middle Triassic formation between the Lower Triassic Montney Formation and Middle Triassic Doig Formation in the Western Canada Sedimentary Basin. Bulletin of Canadian Petroleum Geology, v. 66, p. 193-214.

Furlong, C.M., Gegolick, A., Gingras, M.K., Hernandez, P., Moslow, T., Prenoslo, D, Playter, T. and Zonneveld, J-P. 2018b. Sedimentology and Ichnology of the Middle Triassic (Anisian) Sunset Prairie Formation of the Western Canada Sedimentary Basin. Bulletin of Canadian Petroleum Geology, v. 66, p. 215-236.

PRESENTER: Carolyn Furlong, University of Alberta

Carolyn Furlong received her Ph.D. in geology from the University of Alberta in 2019. Her thesis focused on naming and describing the Sunset Prairie Formation. Her previous research has focused on understanding the interplay between geology and biology within both modern and ancient settings. Carolyn holds a B.Sc. in earth science education from the State University of New York College at Cortland and a M.Sc. from in geology from the University of Alberta.

April 28, 2020