October 2020 – CSUR Technical Webinar #2

Liquids in the Lower Montney: Investigations Using Fluid Dynamics Data

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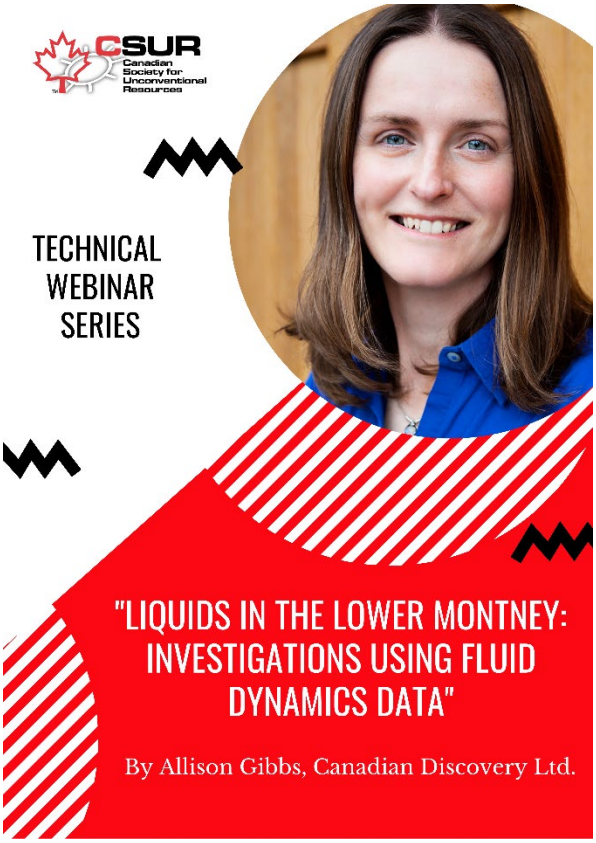

Allison Gibbs, Senior Hydronamicist with Canadian Discovery Ltd. (CDL), was the featured speaker at CSUR's Technical Webinar Series as she presented her study on the Lower Montney Formation. During the subsequent Q/A session, Allison was joined by her colleague & co-author Jeff Horton, who is an Evaluations Engineer at CDL and assessed the completions aspects within the study. The focus of their study and indeed the presentation was specifically investigating the valuable liquids content of the hydrocarbons within the Lower Montney using fluid dynamics data.

In presenting the general background of the formation and depositional history, Allison alluded to the complex geothermic & hydrodynamic systems that dominate the Triassic Montney Formation in British Columbia and Alberta. Specifically, the speaker pointed to the variation in the reservoir quality, source rocks and migration patterns that need to be considered in order to evaluate & identify the key drivers for the Lower Middle Montney and Lower Montney zones. While the Montney is normally-pressured with a more conventional type system dominating the eastern fairway, the overall system transitions to an unconventional deep-basin style environment to the north & west and into NE British Columbia.

The scope of the study involved utilizing all available publicly sourced data from both provinces. Reservoir pressure, temperature, production and gas chemistry datasets were scrutinized and strictly evaluated for representativeness to provide critical understanding as they were incorporated into CDL's regional geologic framework. This data was then paired with subsurface drivers such as mobility (k/μ) & reservoir heterogeneity and completion design to gain a better understanding of reservoir productivity / deliverability.

Although subsurface parameters and geology are key contributing factors, the study concluded that increasing the completion intensity (proppant, cluster spacing, etc.) tended to result in better wells drilled into the Lower Middle & Lower Montney Formations. Specific case studies were then shown to corroborate this conclusion where operators had improved their wells' overall performance via an aggressive completion design.

Summary

Since unconventional development via horizontal drilling and multi-stage hydraulic fracturing began in the Montney Formation around 2005, drilling has largely been focused on Upper and Upper Middle Montney low permeability distal dolomitic siltstones. Over the last few years, economics have dictated targeting the more liquids-rich areas at the expense of the drier gas regions. Operators have started to pursue liquids in the Lower Middle and Lower Montney zones from the same pads that they are developing the upper zones —with interesting results. In some areas, the lower zones appear to be more liquids-rich than the upper zones and are emerging as viable targets.

Background and Theory

The Triassic Montney Formation of Alberta and British Columbia is a mixed siliciclastic-carbonate wedge deposited in shallow marine and shelf environments. It is comprised of several sedimentary facies, ranging from distal shoreface siltstones with numerous turbidite complexes in the west, to proximal shoreface-associated fine-grained sandstones and coquinas in the east (CDL, 2018).

Variable reservoir quality, multiple source rocks and phases of migration, and structural history have all contributed to a complex hydrodynamic system in the Montney. A normally-pressured conventional system lies in the east, while an unconventional Deep Basin-style hydrocarbon system is located in the west, where an underpressured, oil-dominated fairway grades downdip into liquids-rich and overpressured dry gas fairways (Gibbs and Rakhit, 2019).

When viewed within CDL's regional geologic framework, fluid dynamics data - such as pressure, temperature and gas chemistry - provide important insights into the complex relationships controlling the distribution of reservoir fluids in the Montney.

Workflow and Conclusions

In this investigation focusing on the Lower Middle and Lower Montney zones, a workflow is introduced for using fluid dynamics data to identify liquids domains and establish analogue areas within the Montney. We examine production results as a function of completion design and subsurface flow properties – such as mobility and heterogeneity – and describe how these analytics can provide further insight on deliverability within varying liquids domains. Case studies from the unconventional Deep Basin system from Kakwa in west-central Alberta to Blueberry in British Columbia will be examined.

References

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PRESENTER: Allison Gibbs, Canadian Discovery Ltd.

Allison Gibbs is a Senior Hydrodynamicist for Canadian Discovery. She holds a Bachelor of Earth and Planetary Science from McGill University and has almost 20 years of experience in the Western Canadian oil and gas sector. Allison has held variety of roles over her career including Development Geologist focusing on EOR, Geomodeler in a Reservoir Simulation group, and her current role as Petroleum Hydrodynamicist.