Saskatchewan Geological Society Lecture

Tuesday, October 3, 2017

The Ice Age and the Giant Bakken Oil Accumulation

by Dr. Bruce Hart

American Association of Petroleum Geologists DISTINGUISHED LECTURER

(abstract & bio below)

Artful Dodger, 1631 – 11th Avenue, Regina

Lunch: 11:45 am
Meeting Talk: 12:15 to ~1:00 pm

For lunch, the cost is:
S.G.S Members: $15.00
Student Members: $5.00
Non-members: $20.00

For those members not having lunch, the talk is free.

Please contact k.kreis@sasktel.net
by 12:00 pm, Friday, September 29 if you plan on having lunch.

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AAPG/SEG Distinguished Lecture Series

Bruce Hart

"The Ice Age and the Giant Bakken Oil Accumulation"

Bruce Hart is a research scientist with Statoil leading the study of shale and unconventional exploration and development.

Prior to joining Statoil, Hart held positions with ConocoPhillips, McGill University, New Mexico Tech, Penn State and the Geological Survey of Canada.

He received a bachelor's degree in geography and geology from McMaster University, a master's degree in oceanography from Universite du Quebec a Rimouski and a doctorate in geology from the University of Western Ontario.

He has authored or co-authored more than 60 peer-reviewed publications (three of which won Best Paper awards) on shales, seismic attributes, clastic sedimentology, fractured reservoirs, pore-pressure prediction, sequence stratigraphy and other topics. He has written more than 50 papers as SPE and URTeC papers, paper in trade journals and extended abstracts. He authored a digital textbook on seismic interpretation for AAPG, and has given short courses on that topic in Houston, London, Cairo, Kuala Lumpur, Calgary and Vienna.

He previously toured as the AAPG-SEG Distinguished Lecturer in 2019-10, and as a Guest Lecturer for the Canadian Society of Petroleum Geologists in 2006.

Tuesday, October 3

11:45 a.m.

The Artful Dodger Café & Music Emporium

1651 11th Ave.

Regina, SK S4P 0H7, Canada

AAPG Distinguished Lecture Program

Abstract: Ice Age and the Giant Bakken Oil Accumulation

The Ice Age and the Giant Bakken Oil Accumulation

The USGS estimated (2013) that the Late Devonian to Early Mississippian Bakken Formation holds in excess of 7 billion barrels (~1.1 billion m3) of recoverable oil, making it one of the top 50 largest oilfields in the world. Most of the production comes from shallow-marine sandstones of the Middle Bakken Member that are directly over- and underlain by extremely organic-rich shale source rocks (Upper and Lower Bakken Shale members respectively). Although not oil-productive everywhere, the Middle Bakken forms a relatively sheet-like unit that covers an area of over 200,000 square miles (~520,000 km2) of the intracratonic Williston Basin.

The vertical juxtaposition of shallow-marine reservoir and more distal source rocks over such a large area, without intervening transitional facies, is unusual from a stratigraphic perspective. One possible explanation would require global fluctuations of sea level to drive geologically rapid and extensive shoreline movements in this relatively stable basin. Forced regression associated with falling sea level could explain the lack of transitional facies (e.g., inner shelf) between the distal Lower Bakken Shale and the overlying Middle Bakken (a sharp-based shoreface). Subsequent sea-level rise would have caused rapid and extensive transgression, leading to the observed stratigraphic relationships between the Middle and Upper Bakken members. But what could have caused the changes in sea level?

A considerable body of evidence points to a Late Devonian-Early Mississippian ice age that covered portions of Gondwana (e.g., parts of present-day Brazil) that were situated close to the paleo South Pole. This ice age consisted of more than one glacial/interglacial cycle and was probably triggered by massive removal of CO2 from the atmosphere by land plants and organic-rich shales. Some evidence indicates that at least 100 m of sea-level drop took place during one of the Famennian glaciations, which would have effectively drained the Williston Basin and induced major shoreline progradation. Melting of the ice sheets would have caused transgression and reflooding of the basin and deposition of the Upper Bakken Shale. Other basins around the world record similar evidence for glacioeustacy near the Devonian-Mississippian transition. The glacial/interglacial cycles are expressed differently from basin to basin, reflecting the interplay between fluctuations of global sea level and each basin's history of subsidence and sediment supply.