

## First results on sequence stratigraphy, sedimentary architecture, mineralogy and organic content in the Montney and Doig Formations (Alberta / British Columbia)

*Vincent Crombez - IFP Energies nouvelles, IStEP,*

*Sébastien Rohais – IFP Energies nouvelles,*

*François Baudin – IStEP,*

*Tristan Euzen – IFP Technologies, Canada Inc.*

*Matthew Power – SGS Canada Inc.*

### Summary

In the last decade, rapid increase in the world's hydrocarbon demand has brought the focus on shale resources. Since the 50's, the Lower-Middle Triassic Montney and Doig Formations are well known in the Western Canada for their conventional hydrocarbons resources. In the last five years they became the focus of numerous studies carrying out a spectacular potential for unconventional resources (NEB, 2013).

Within these new plays, the knowledge of TOC and mineralogical heterogeneities distribution in sedimentary basins is one of the key elements that will improve hydrocarbons discovery and production.

Numerous QEMSCAN analysis, Rock-Eval analysis, palynofacies studies and thin sections analysis had been done on core samples along a 2D section. This study intends to establish links between sequence stratigraphy, sedimentary architecture, mineralogy and organic content the organic rich Montney and Doig Formations.

### The Montney and Doig Formations

The Montney and Doig Formations mainly consist of siltstones and fine-grained sandstones (Zonneveld et al., 2010). Their deposition took place during Early to middle Triassic on the Western margin of Pangea (Edwards et al., 1994). Organic content study shows TOC values between 0.8% and 4.7% in the Montney and 1.12% and 11% in the “*Phosphates zones*” (Ibarhimbas and Riediger, 2004). The occurrence of Lower and Middle Triassic strata in the fold and thrust belt of the Canadian Cordillera as well as the availability of an outsized dataset of wells and cores in the Peace river's subcrop makes the Montney and Doig Formations a perfect analogues for the study of sedimentary heterogeneities in organic-rich deposits.

### Material and Method

This study integrates core and outcrop descriptions along a 450 km-long 2D section in order to provide a finer characterization of the sedimentary architecture. The 2D section is based on 39 wells from the proximal part in the SE of the basin, to the distal part in the NW. Numerous analyses have been conducted on both outcrop and core samples, as well as drill cuttings. The integration of more than 400 Rock-Eval analysis, 50 QEMSCAN analysis, 20 thin sections and palynofacies recognition in a well-constrain stratigraphic setting allow to study the depositional model of heterogeneities in organic rich formations.

## Results and conclusions

High resolution sequence stratigraphy on a 2D section brings significant insights on the Montney and Doig sedimentary architecture. It shows the “G-Sand” as backstepping shorefaces during the first transgression above the Belloy contact and also suggest that the “Mid-Montney-Turbidites” is related to the first lowstand system tract. The occurrence of multiple diachronous “Phosphates zones” within the Doig Formation is also highlighted.

The comparative study of Rock-Eval, QEMSCAN, thin sections analysis and palynofacies recognition, on samples distributed in different sequences and system tracts allows, for the first time, to establish a link between sedimentary facies, mineralogical heterogeneities, organic content and sequence stratigraphy.

Up to now, geochemical analyses have been conducted on samples from Alberta. A field session during spring 2014 is planned to collect samples from British Columbia in order to complete our dataset.

The final goal of the present PhD project is to provide a detailed sequence stratigraphy analysis of the basin along multiple sections in order to establish a 3D model of organic content in the Montney and Doig Formations.

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