**Petroleum System Evaluation of the Korotaikha Fold-belt and Foreland Basin, Timan-Pechora Basin, Russia**

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Abstract

The 4MM acre Korotaikha foreland basin and foldbelt is situated in the northeastern Timan-Pechora Basin, adjacent to producing acreage in the Varandey-Adzva Structural Zone (VAZ). A screening-level exploration analysis was carried out in 2011 in this Cimmerian and younger-aged basin to evaluate exploration potential. This poster will focus on the petroleum system analysis. Three main plays based on structural and fluid-flow migration regimes have been identified in the study area. Five main trap styles exist, however only the sub-thrust and imbricate thrust sheet trap types are present within the blocks offered for tender that encompass the Fold-Belt (FB) and Flank FB Plays. Significant running room has been identified in both plays. The petroleum system analysis indicates that historical heat flow is a critical uncertainly, and the main imbricate thrust Yangarey lead, located within the fold-belt play, is likely to be primarily charged with gas.
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1. Introduction

This poster is designed for the reader to ‘walk through’ each of the figures, starting with figure 1 below. Captions are expanded to include the necessary level of detail.

Figure 1 below illustrates the infrastructure and license status in the northern Timan-Pechora regions. The study area is noted within the blue circle, however the study focused on the Verkhne-Yangarey, Yangerare and Sibiransky blocks.

2. Database

Figure 2. Location map, northeastern Timan-Pechora Basin, Russia. ConocoPhillips acreage (NMNG & PLC) noted.

3. Tectonic Setting

Figure 3. Tectonic scheme of the Pai-Khoi - Novaya-Zemyla region (Bogatskiy, 1996), Plate Ural Mountains (inner); (2) Fold-belt, (3) Foreland, (4) Foreland basin. Key: D = Devonian, C = Carboniferous, Triassic (T), Carboniferous-Cambrian (CC), M = Mesozoic. 1 = Rosso-Isachanian; 2 = Volga-Kama; 3 = Amurian; 4 = Samogitian; 5 = Albian. Key insights pertaining to regional tectonic history to the south in the Ural Mountains were based on Puchkov (2009). See identified trap types in figure 7.

4. Stratigraphy, Hydrocarbon Occurrence and Plays

Figure 4. Summary stratigraphic sections. Sedimentary rock nomenclature: (1) sandstone, (2) siltstone, (3) shale, (4) limestone, (5) dolostone, (6) marl, (7) coal, (8) shaly limestone, (9) red mudstone. Oil occurs in (1) sandstone and dolostone, (2) siltstone and limestone, and (3) shale. 1 = Lower Cretaceous, 2 = Middle Jurassic, 3 = Lower Triassic, 4 = Upper Triassic, 5 = Lower Permian, 6 = Upper Permian, 7 = Carboniferous, 8 = Devonian, 9 = Lower Carboniferous.

5. Structural History and Trap Characterization

A 2D structural interpretation project (Grant, 2011) was carried out utilizing three deep-penetrating 2D seismic lines in time (fig. 8), that were later depth-converted using regional velocity control. Results of line PC-15, which traverses the key calibration Labogei-15 well and the large four-way dip closure lead Yangarey (maximum area under closure of ~40,000 acres) is displayed in figure 7. Interpretation of the three transects was carried out to be ‘visually balanced’ and to demonstrate a consistent structural style emphasizing detached thrusting. Initial structural balancing is demonstrated below. Main implications for the petroleum system include: (1) the distribution of thrusting and levels of detachment influence the potential trap types within the fold-thrust belt. See identified trap types in figure 7, (2) the syn-tectonic foreland basin molasse of Permo-Triasic age is a plastic system with poor source rock potential, (3) the most interesting structures are the large imbricate thrust sheets within the fold-belt proper (e.g. Yangarey). These sheets have been uplifted to depths that can be reached by the drill bit, (4) if preserved Triassic strata is all pre-tectonic, it probably implies significant erosion across the area.

Insights from the structural analysis were integrated in the 1D basin modeling illustrated on poster panel 2 (figures 12-21).

6. Structural Analogs – Vuktyl / Yugid-Vuktyl Fields

Figure 5. Structural analogs were mapped for oil prone area of the Vuktyl and Yugid-Vuktyl fields. See images in each corresponding location on the 3D structural map for leads and prospects within the Korotaikha Basin.
7. Petroleum System Analysis

A screening-level petroleum systems analysis was carried out for the Korotaikha region, with the main goals of determining the presence of an active petroleum system, high-grade the play types and determine the likelihood of oil vs. gas charge. Maturity and AFTA data were available in the calibration well Labogei-15 (Duddy, 2011), and critical coal rank maturity (Anashenko, 2004) and geothermal gradient data were available across the mapped leads in the fold-belt and flank sub-thrust plays. Lithology data were available throughout the region, and tops were driven by well log correlations and results of the structural analysis and 7. Petroleum System Analysis

Local petroleum systems are typically characterized by a source (Silurian-Devonian), reservoir (Silurian and Devonian carbonates, Lower Devonian clastics), and seals (Permian and Cimmerian clastics). The source rock intervals are hypothesized; oil-prone Ordovician / Silurian and Lower Devonian, gas-prone Lower Devonian, and gas-prone Permian clastics. The Deltaic Facies and Flank Sub-thrust areas are the areas of basin play, which are quite deep, in general a re  four-way closures, perhaps related to deep structural culminations that sourced the traps in the described structural position.

8. Discussion and Conclusions

The exploration maturity of the Korotaikha region is low, with a limited 2D seismic database of varying vintages and a handful of limited 2D seismic data, regional stratigraphic, basin, and structural position. The exploration maturity of the Korotaikha region is low, with a limited 2D seismic database of varying vintages and a handful of limited 2D seismic data. Regional stratigraphic, basin, and structural position.

Regional present-day temperature data from down-hole measurements and heat flow modeling suggest a relatively cool present-day foreland trough and fold-belt, with a geotherm of around 19 °C per km, suggesting the top and base of the present-day oil window is at 1,000 and 4,600 meters respectively. However, historical heat flow values calibrated to nearby coal rank maturity data, coupled with the burial and uplift history, suggest that the main Yangarey block lead in the fold-belt play is gas-charged. The data also suggest that the heat flow history is cooler in the Verkhine-Yangarey and Sibirska blocks, suggesting a better chance of oil-charged traps in those regions. Additional risks include adverse effects of deep burial on reservoir quality, and loss of containment due to uplift and erosion.

9. Key References

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