

## MOLECULAR MARKER COMPOSITIONS OF OILS FROM THE MESOPROTEROZOIC RESERVOIRS IN THE LIAOXI DEPRESSION, NORTHEAST CHINA

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### Introduction

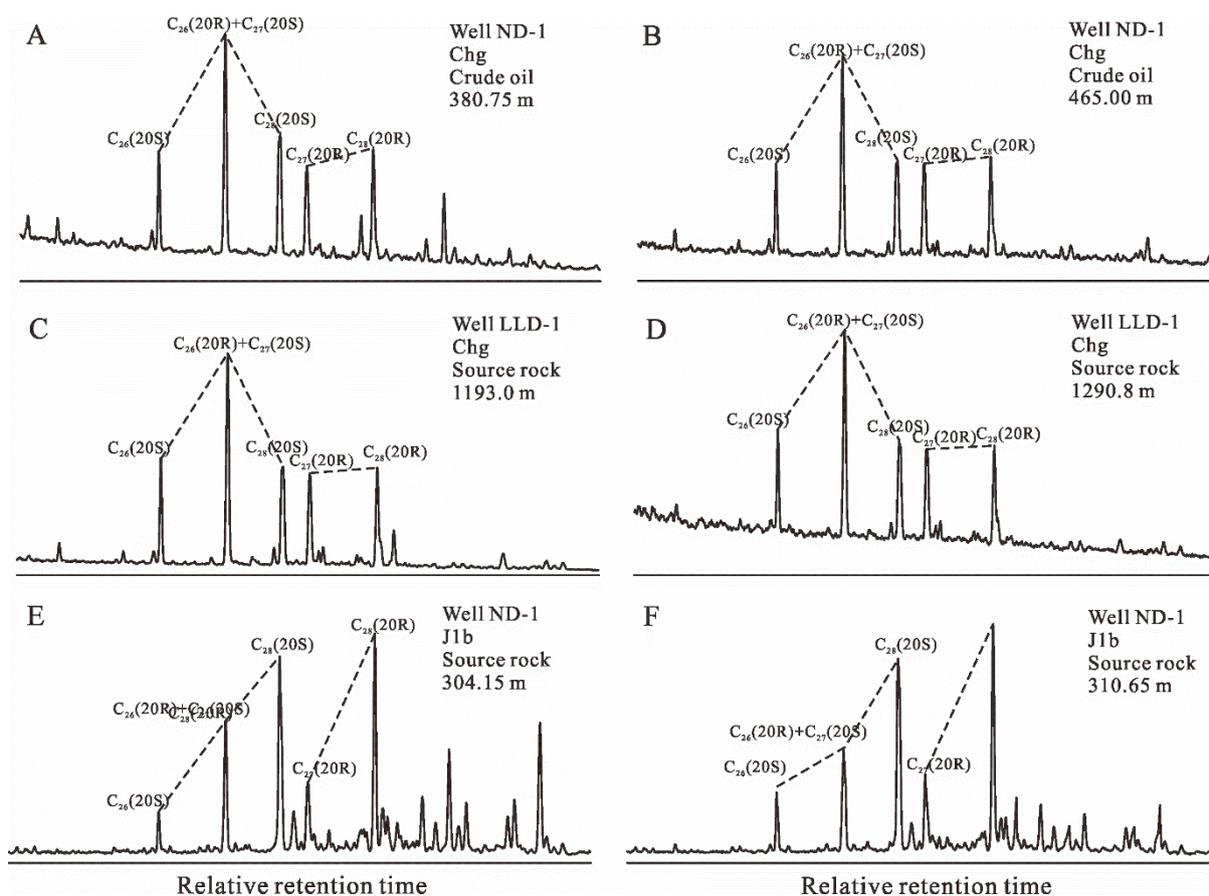
Bituminous sandstones and oil-seepages have been discovered in the Mesoproterozoic strata (1800~1327 Ma) in the Yanliao Faulted-Depression Zone (YFDZ), northeast China (e.g. Wang and Han, 2011; Wang et al., 2016). Previous studies show that oils in the Mesoproterozoic Ximaling Formation in the Jibei Depression of YFDZ were mainly derived from the source rocks of Mesoproterozoic Gaoyuzhuang and Hongshuizhuang formations (Wang et al., 2016). Recently, a borehole (Well ND-1) has been drilled in the Liaoxi Depression of YFDZ (e.g. Xiao et al., 2018) and oil shows and potential source rocks have been found in Mesoproterozoic strata. A set of 12 rocks from Mesoproterozoic Gaoyuzhuang Formation and Low Jurassic Beipiao Formation were geochemically analysed in this study. Based on the systematic geochemical experiments of extractable organic matter in rocks, the comprehensive geochemical characteristics, especially, the molecular marker compositions were investigated to determine the source and origin of Mesoproterozoic hydrocarbon.

### Results

All rocks have been Soxhlet extracted and the extractable organic matter (EOM) have been separated into saturate, aromatic, resin and asphaltene fractions. Gas chromatography-mass spectrometry has been performed on saturate and aromatic hydrocarbon fractions to reveal the molecular marker compositions in all samples. The result show that all rock samples have intact normal alkane series with carbon number of 15 to 35 and acyclic isoprenoids (pristane and phytane). The ratio of pristane to phytane is lower than 1.0, generally indicating anoxic to suboxic depositional environment. Tricyclic terpanes (TT) and hopanes (H) with dominance of C<sub>23</sub> TT and C<sub>30</sub> hopane in respective series occurred in all oil shows and Mesoproterozoic source rocks. C<sub>27</sub>-C<sub>28</sub>-C<sub>29</sub> regular steranes and C<sub>26</sub>-C<sub>27</sub>-C<sub>28</sub> tri-aromatic steroids were detected in all oil shows and rocks. The oils have similar distribution patterns of steranes and tri-aromatic steroids to Mesoproterozoic Gaoyuzhuang Formation are different from those of Lower Jurassic Beipiao Formation (Figure 1). The maturity indicators relative to the abundance of methylphenanthrenes and methylated naphthalenes suggested that oils show have higher maturation levels equivalent to that of Gaoyuzhuang Formation and significantly higher than that of Lower Jurassic Beipiao source rocks.

### Conclusions

The molecular marker signatures in oil shows and rock samples shows the hydrocarbon generation potential of ancient Mesoproterozoic (1800~1327 Ma) source rocks in the Liaoxi Depression, Yanliao Faulted-Depression Zone, northeast China. The results provided reliable geochemical evidence for the occurrence of hydrocarbons that were derived from ancient Precambrian source rocks in the study area.



**Figure 1** The distribution of tri-aromatic steroids (TAS) in oil shows, source rocks from Mesoproterozoic Gaoyuzhuang and Lower Jurassic Beipiao formations ( $m/z$  231 mass chromatograms of aromatic fractions) in the Liaoxi Depression, NE China.

## References

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