

**PS Basin Modeling and Hydrocarbon Source Rock Potential of Middle Eocene  
Ngimbang Formation in East Java Basin, Indonesia\***

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**Abstract**

East Java Basin is one of the successful hydrocarbon producers in Indonesia. East Java Basin is a back-arc basin and it was the result of collision between the Indian Plate and Sunda Microplate. In the Rembang Zone, Middle Eocene Ngimbang Formation is known as source rock materials and it consists of sandstone, siltstone, limestone, shale, and coal seams.

Hydrocarbon source rock potential and 1D basin model have been performed by interpreting log, seismic, and geochemistry data. These methods give an insight for exploring hydrocarbons. In the results, TOC ranges from 0.40 wt% – 4.31 wt% with kerogen types II/III oil and gas. Generation, migration, accumulation, and preservation happened in Early Miocene or 23 million years ago from south to north migration pathway of the research area.

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# Basin Modeling and Hydrocarbon Source Rock Potential of Middle Eocene Ngimbang Formation in East Java Basin, Indonesia

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A Global Oil & Gas Hotspot: Unleashing the Petroleum Systems Potential

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## ABSTRACTS

East Java Basin is the back-arc basin and it was the result of collision between the Indian Plate and Sunda Microplate. East Java Basin was formed in Early Tertiary subduction and it is related on the process in Java. In the exploration of Indonesian Basin over years, East Java is one of the successful hydrocarbon producers in Indonesia. In East Java Basin especially Rembang Zone, The Middle Eocene Ngimbang Formation is known as source rock materials. It consists of sandstone, siltstone, limestone, shale, and coal seams.

The objective of this research is to determine the hydrocarbon source rock potential based on geochemical analyses and thermal maturation by making basin model. The main target source rock formation is Middle Eocene Ngimbang Formation. Log, seismic, and geochemical sample are the primary data in this research. These methods help the sense of exploring the new hydrocarbon potential.

According to geochemical analyses, the source rock potential within TOC value in this area is good – very good. Fine sediments of Middle Eocene Ngimbang Formation tend to produce oil and gas originated from kerogen types II/III. Furthermore, the migration pathway started from south to north. Generation, migration, accumulation, and preservation occurred in Early Miocene or 23 million years ago.

## INTRODUCTION

This research was conducted in Rembang Zone, Onshore East Java Basin, Indonesia. There are two major tectonic activities, which are Paleogene (extension) and Neogene (compression).

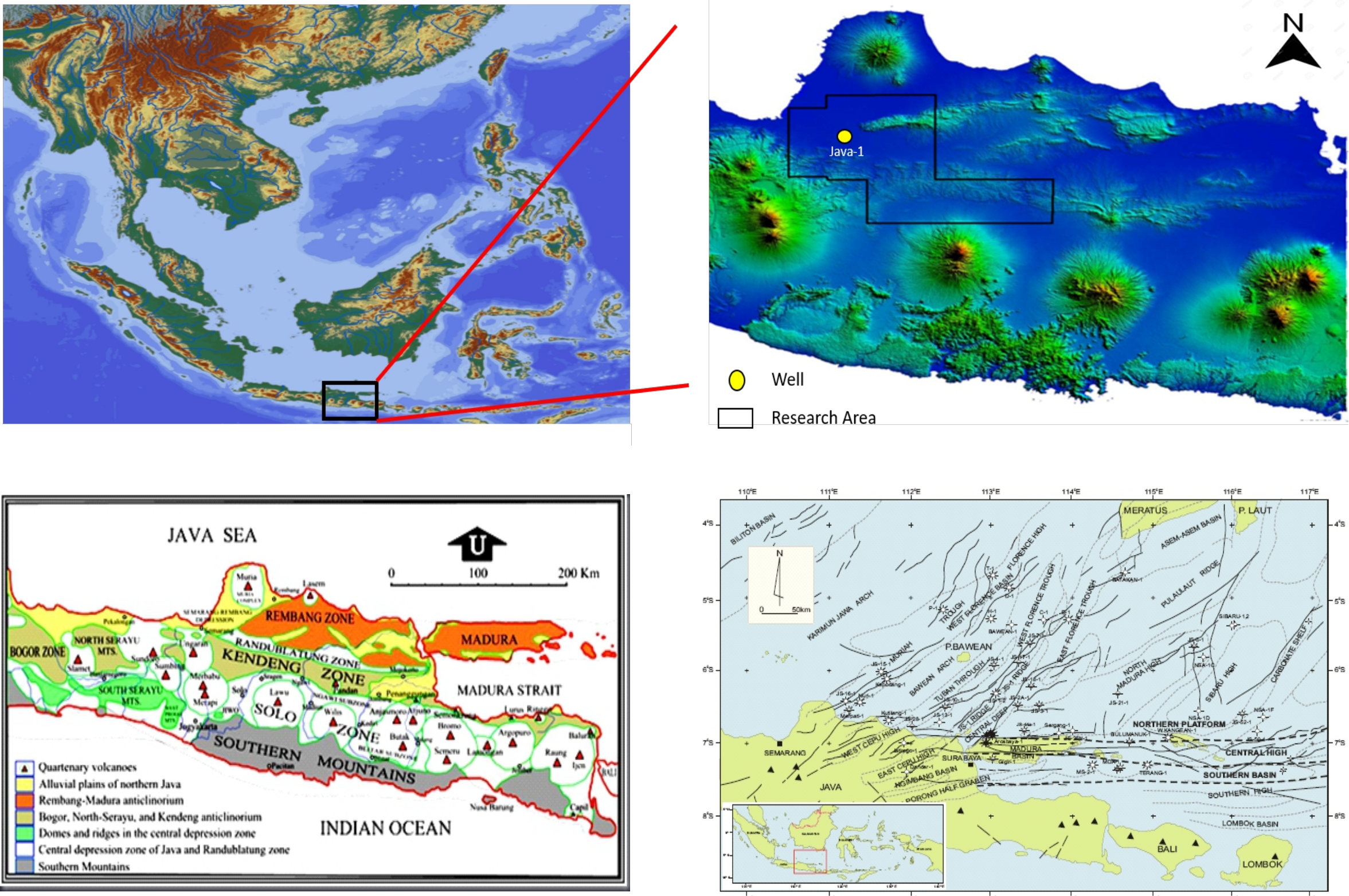


Figure 1. Research Area and Geological Framework

## DATA AND METHOD

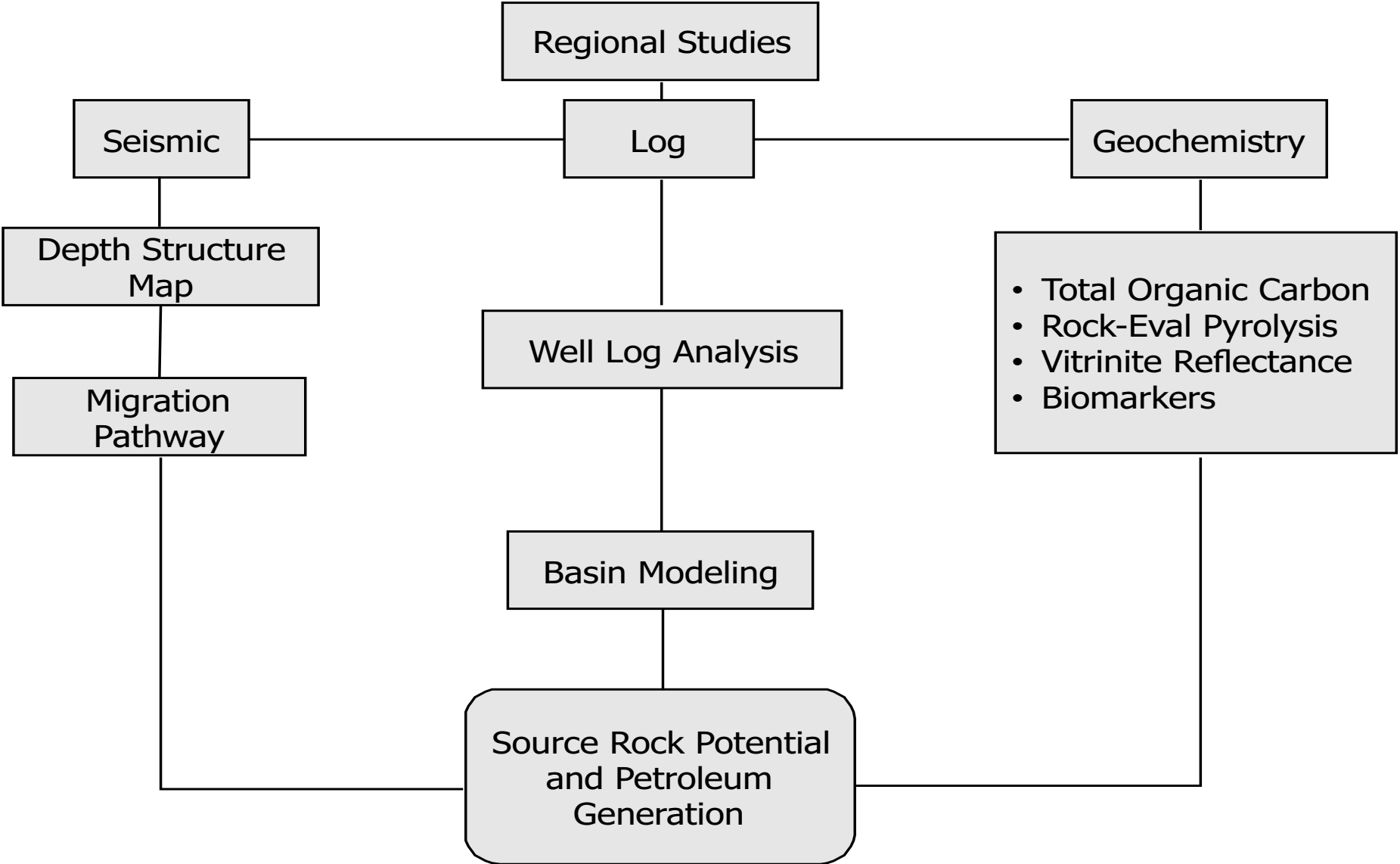


Figure 2. Workflow

## RESULTS AND DISCUSSION

The hydrocarbon discovery occurred at Kujung Formation depth 2330-2375 feet. The target formation in the East Java Basin is Ngimbang Formation to confirm as a source rock potential. Based on well log analysis, Ngimbang Formation consists of sandstone, siltstone, limestone, shale, and coal seams (Figure 3).

Geochemistry source rock characteristics have been performed by plotting into various modified Van Krevelen diagrams. According to geochemistry cross-plots, the TOC value is good-very good, immature-mature, and kerogen type II/III (Figure 4).

By interpreting biomarkers for predicting the depositional environment (Figure 5), the depositional environment of m/z 191 is transition within the presence of oleanane. Estuarine or shallow lacustrine is the resulted from m/z 217 by analyzing within C<sub>27</sub>, C<sub>28</sub>, and C<sub>29</sub> steranes diagram. The results of oil-source rock correlation (Figure 6) revealed that there is a remarkable similarities in general for the oil and extract of the Ngimbang Formation.

Based in 1D basin model, the hydrocarbon generation, migration, accumulation, and preservation started from 23 million years ago. Uplifted activity occurred at 16 million years ago. Furthermore, migration pathway started from south to north of the research area (Figure 7).

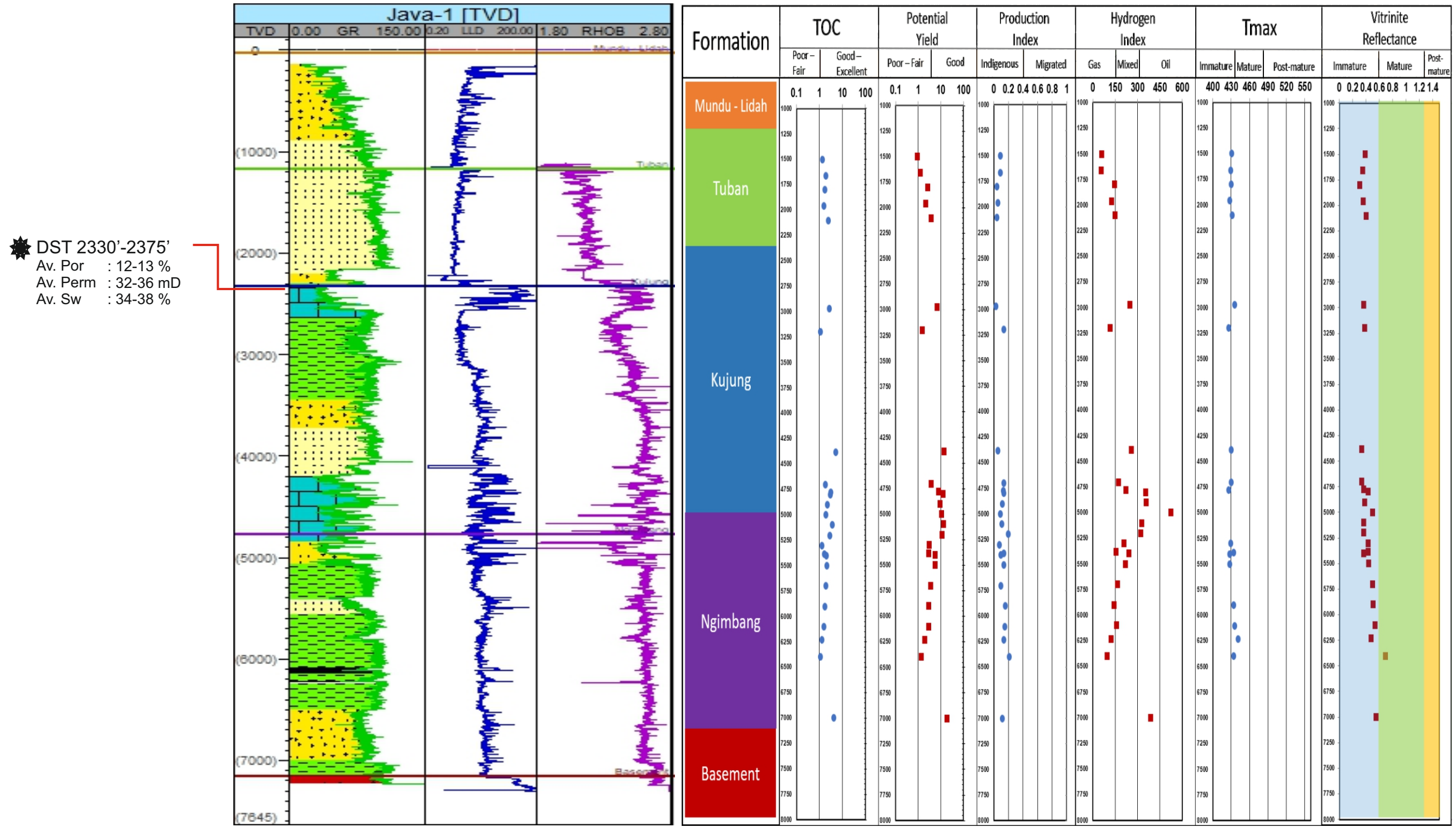


Figure 3. Well Log and Geochemistry Log

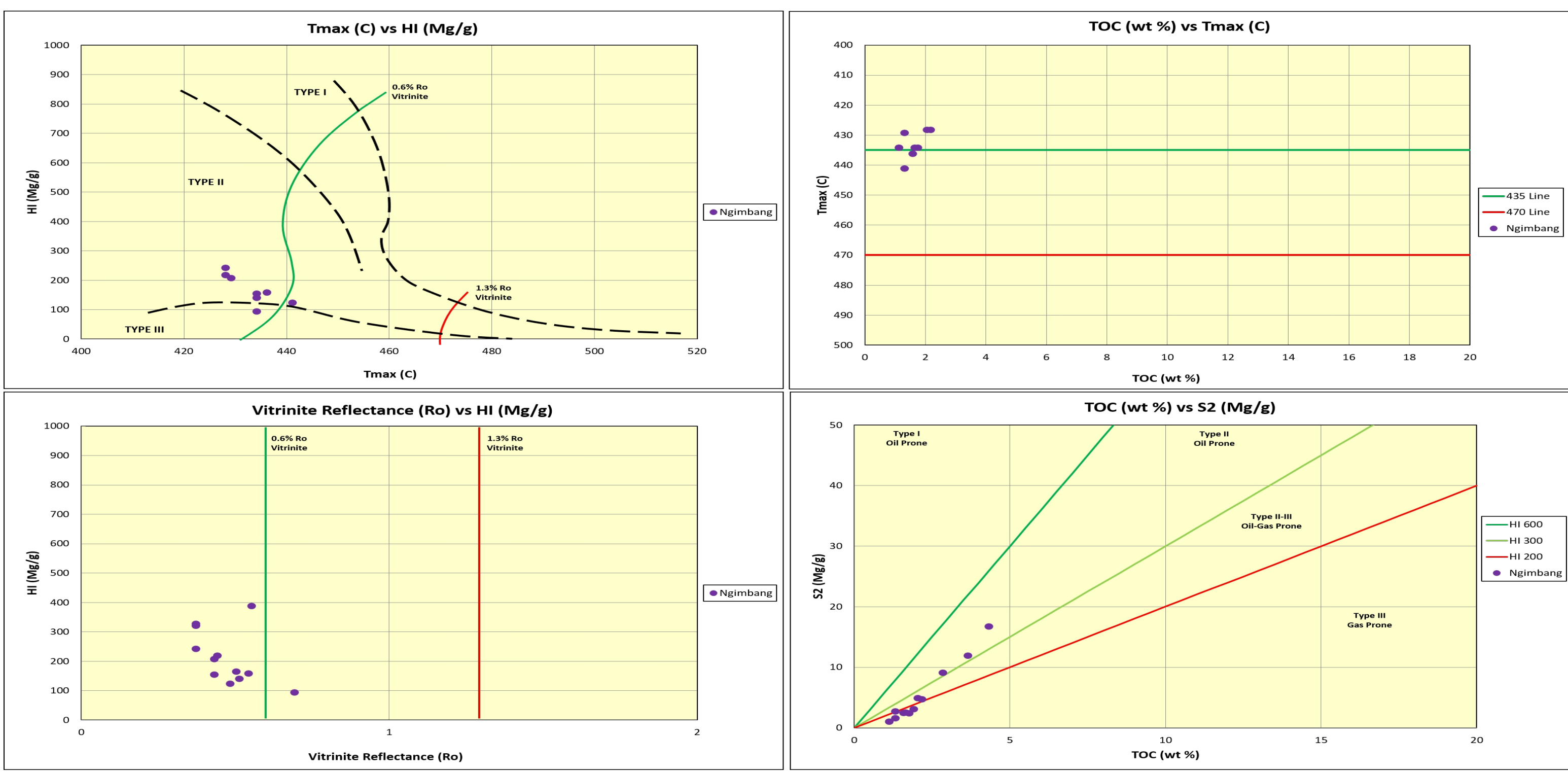


Figure 4. Source Rock Characteristics

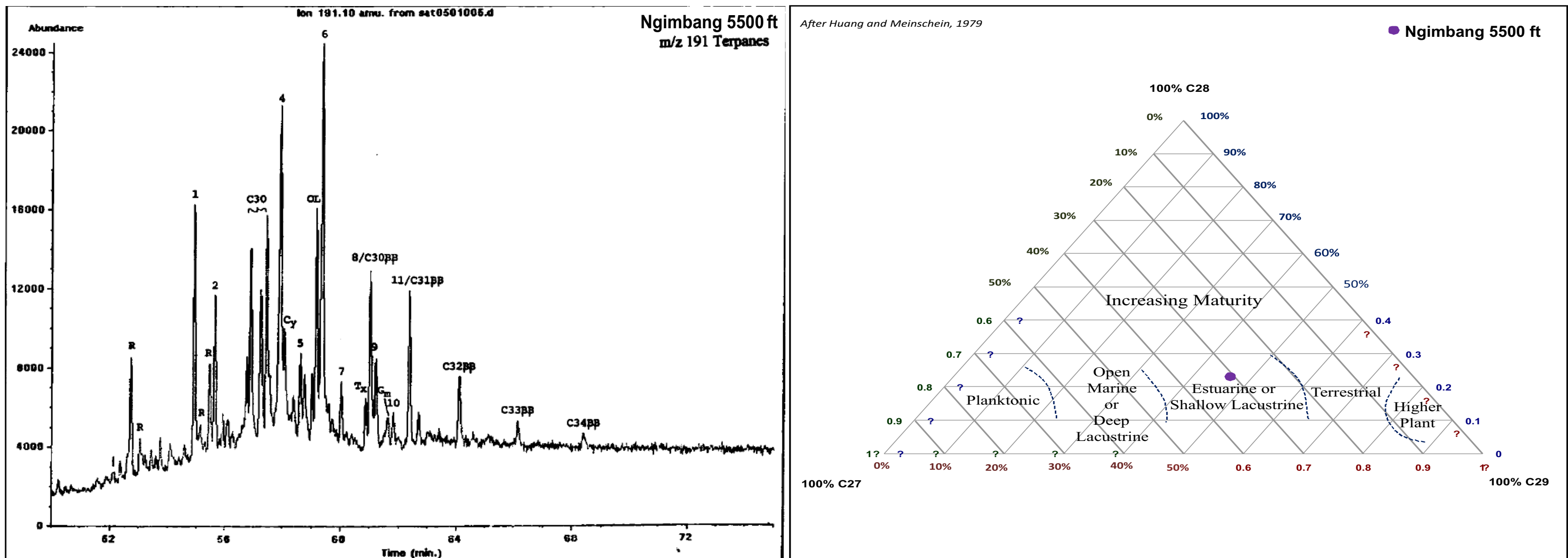


Figure 5. Biomarkers m/z 191 and m/z 217

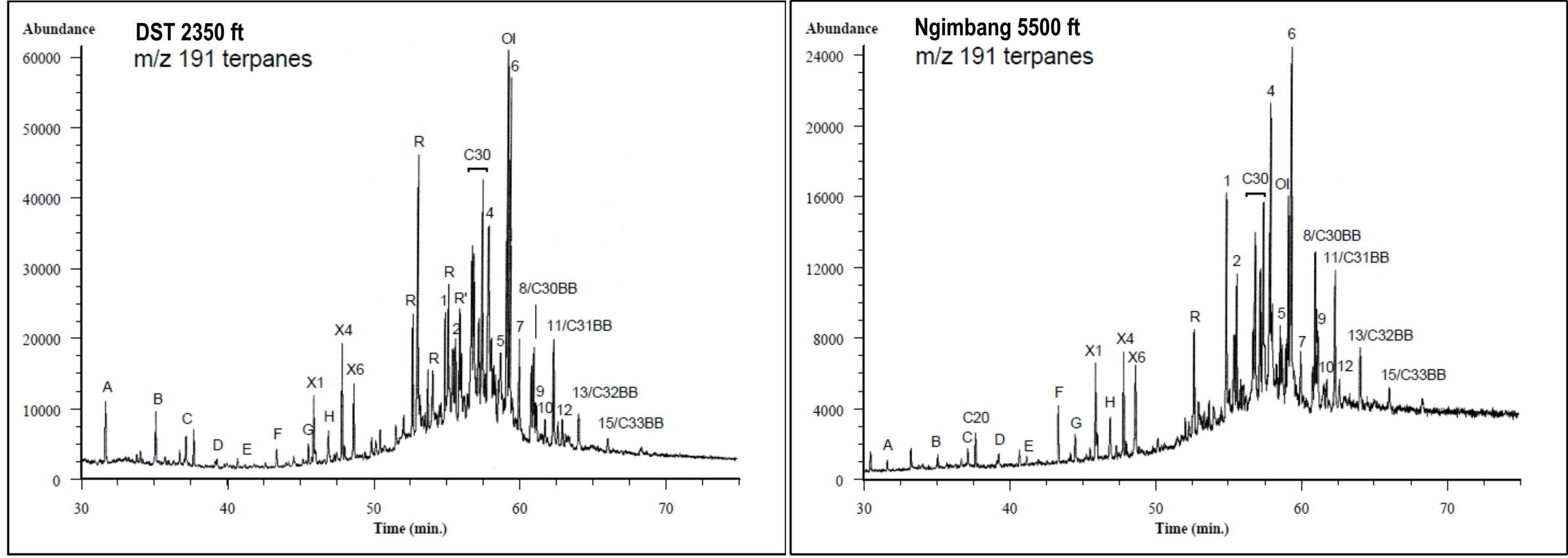


Figure 6. Oil - Source Rock Correlation

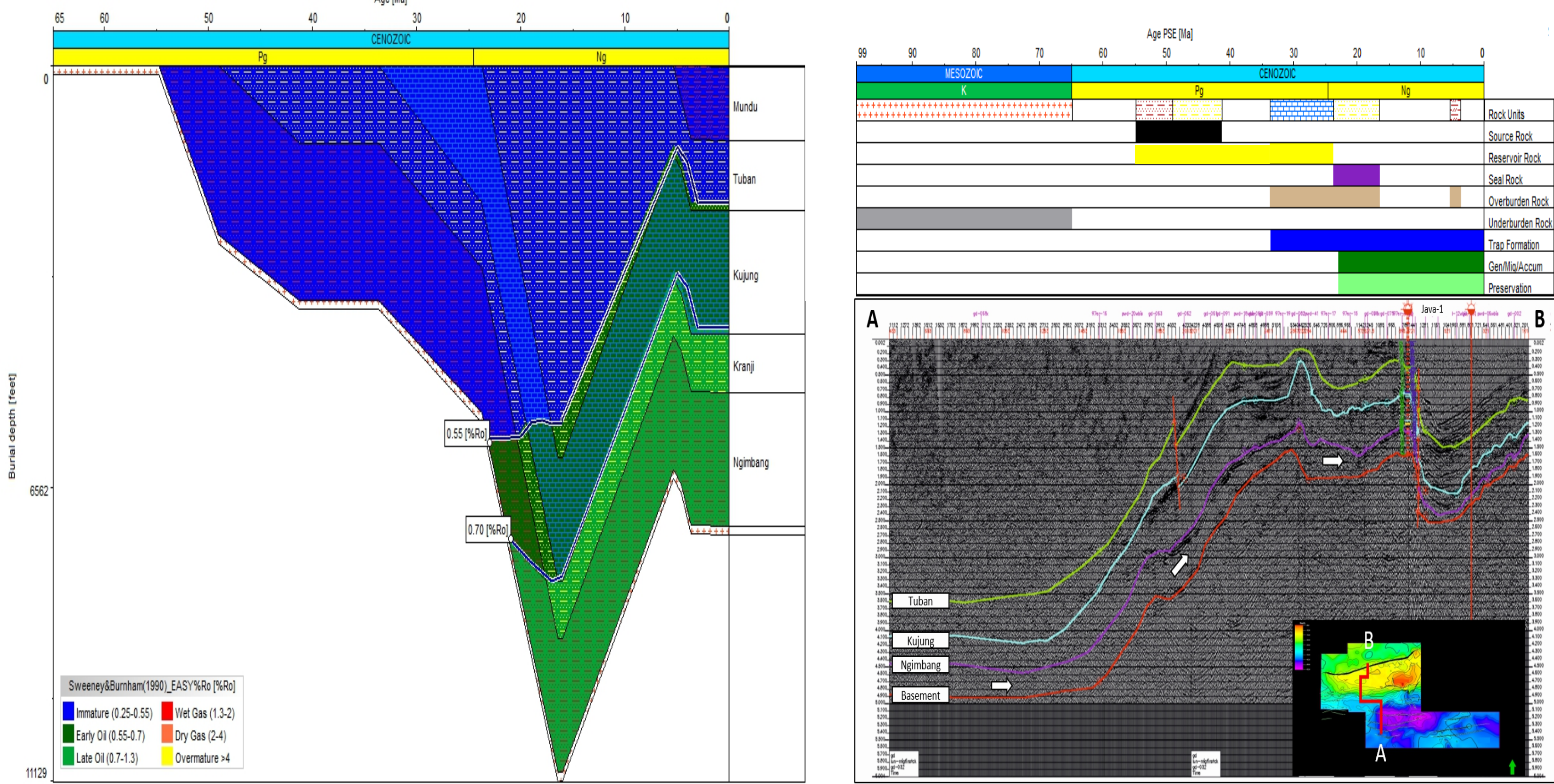


Figure 7. Basin Model and Migration Pathway

## CONCLUSION

- Middle Eocene Ngimbang Formation is effective source rock
- TOC good - very good, immature - mature, kerogen type II/III
- Biomarker m/z 191 illustrates transition depositional environment
- Biomarker m/z 217 illustrates estuarine or shallow lacustrine environment
- Hydrocarbon generation, migration, accumulation, and preservation existed in Early Miocene or 23 mya
- Migration started from south to north of the research area

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