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[EA]Source Rock Potentials and Hydrocarbon Discoveries in Salin Sub-Basin, Myanmar*

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Abstract

Salin Sub-basin called Central Myanmar Basin, located in the Central Myanmar Tertiary Basin Complex, is one of the most petroliferous basins in onshore Myanmar. It covers an area of approximately 9,453 square miles. Tertiary sediments were mainly deposited in this basin. Sediments thickness is approximately over 55,000 ft. The south-central part of the basin is the deepest part with steep flanks. The northern half of the basin is substantially shallower than the southern half because of regional, episodic, uplift in the north.

The basin is defined by a regional north-south trending syncline with many normal, reverse, and thrust faults on both flanks (Figure 1). Upper Eocene to Middle Miocene sandstones are major producing reservoirs associated with compressive, thrust-related anticlinal combination traps. The structural/combination traps were formed by the first phase deformation in Early Miocene followed by the second deformation during the Pliocene to Recent.

Geological and geochemical analyses, including pyrolysis, vitrinite reflectance determination, gas chromatography (GC), gas chromatography – mass spectrometry (GC-MS), and carbon isotope ratio of the samples, were carried out in order to characterize the source rock potentials and depositional environments of the strata. Based on the current analysis data, the Salin Sub-Basin is dominated by fluvial-deltaic / Humic-terrestrial origin as major sources (Figure 2). It is also noted as generally moderate to very good hydrocarbon generation potential in Eocene shales and moderate to good hydrocarbon generation potential in Lower Oligocene shales (Figure 3).

The 1D models were constructed on 8 locations in the basin (Figure 4). The modeling results indicate significant differences in timing of hydrocarbon generation from formation to formation throughout the basin from north to south. The modeling results of pseudo wells in the northern part indicate that the Upper Cretaceous Kabaw shales and Lower Eocene Laungshe shales might have passed main phase of hydrocarbon generation throughout Eocene and Oligocene respectively. Middle Eocene Tabyin shales began to enter main phase of hydrocarbon generation in Middle Pliocene and are still in main hydrocarbon generation phase at present. Large volumes of hydrocarbons

generated from Kabaw and Laungshe shales are likely to have been expelled prior to the formation of traps (Early Miocene and Late Pliocene). Towards the south Upper Eocene Yaw shales and Lower Oligocene Shwezettaw shales are major potential sources for the Salin Sub-basin.

Within the basin, oil bearing strata are progressively younger from north to south, Eocene - Oligocene strata in the north and Oligocene - Miocene strata in the south. The hydrocarbons generated from Salin syncline throughout successive times were migrated into structurally high and uplifted fault blocks vertically or laterally along the fault conduits all over the first line of structures, namely Letpando, Thargyitaung, Sabe, Ayadaw, Yenangyat, Chauk, Yanangyaung, Mann, and Htaukshabin where commercial oil and gas have been discovered. Western part and far eastern part of Salin syncline, i.e., the second line of structures are deemed to discover commercial hydrocarbon fields due to structural effects.

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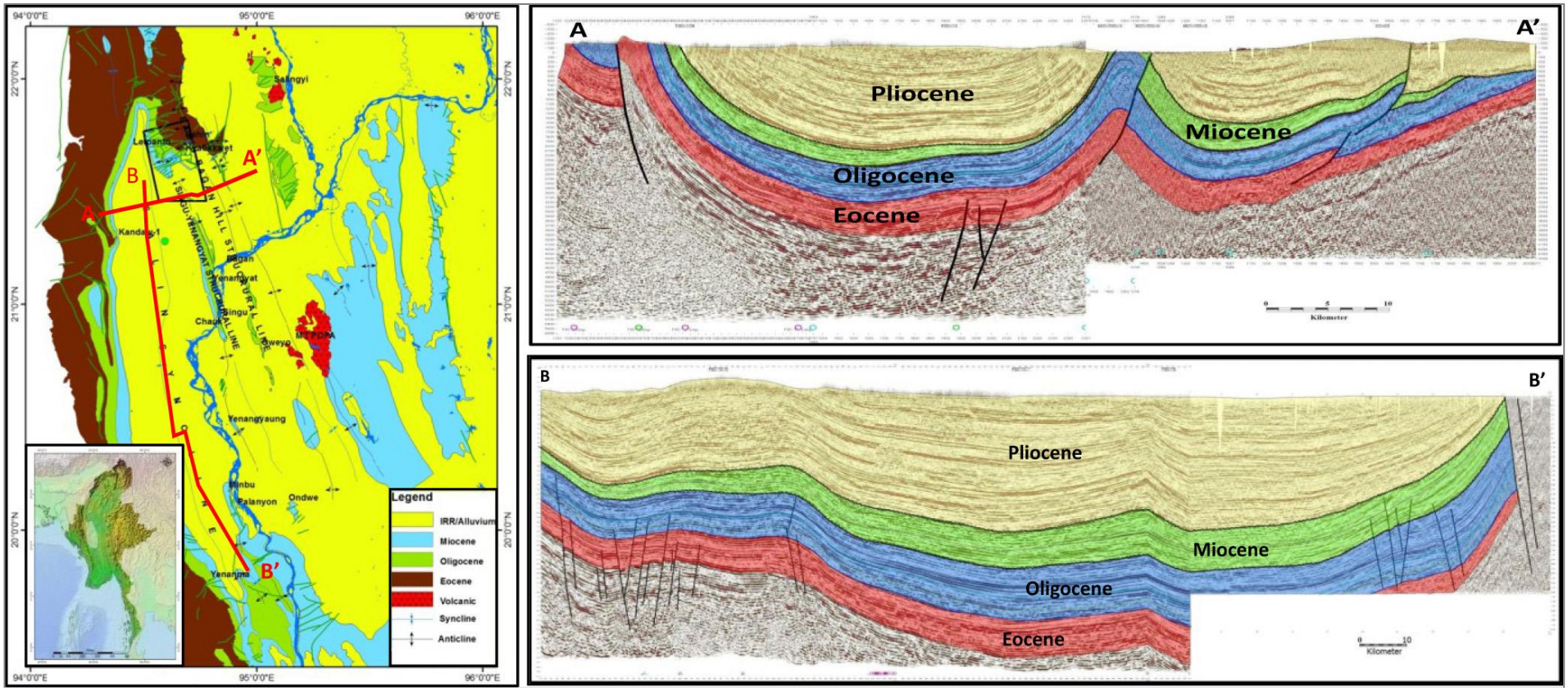

Figure 1. Generalized Geological Map of Salin Sub-basin and its West-East and North-South geo-seismic image.

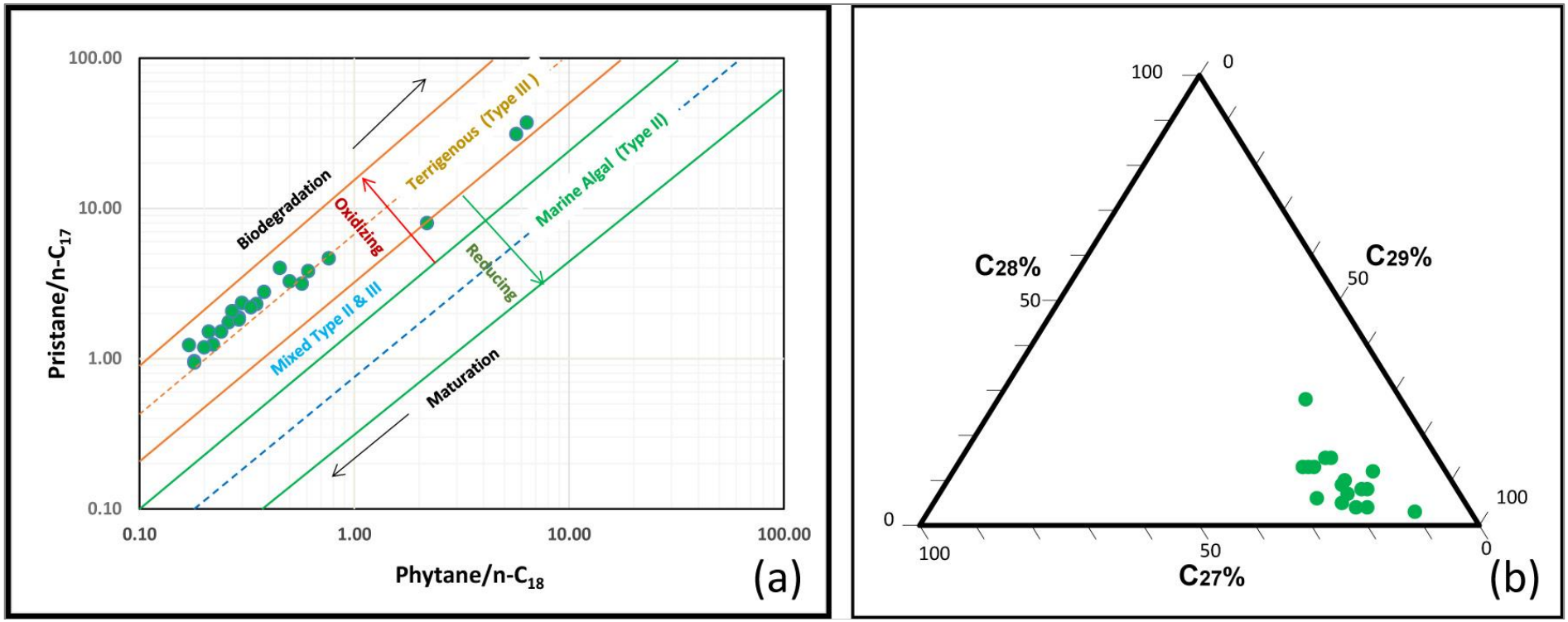

Figure 2. Plots of (a) Pristane/n-C_{17} versus Phytane/n-C_{18} and (b) Ternary diagram of C_{27}, C_{28}, and C_{29} Sterane Composition pointing out source rock depositional environment.

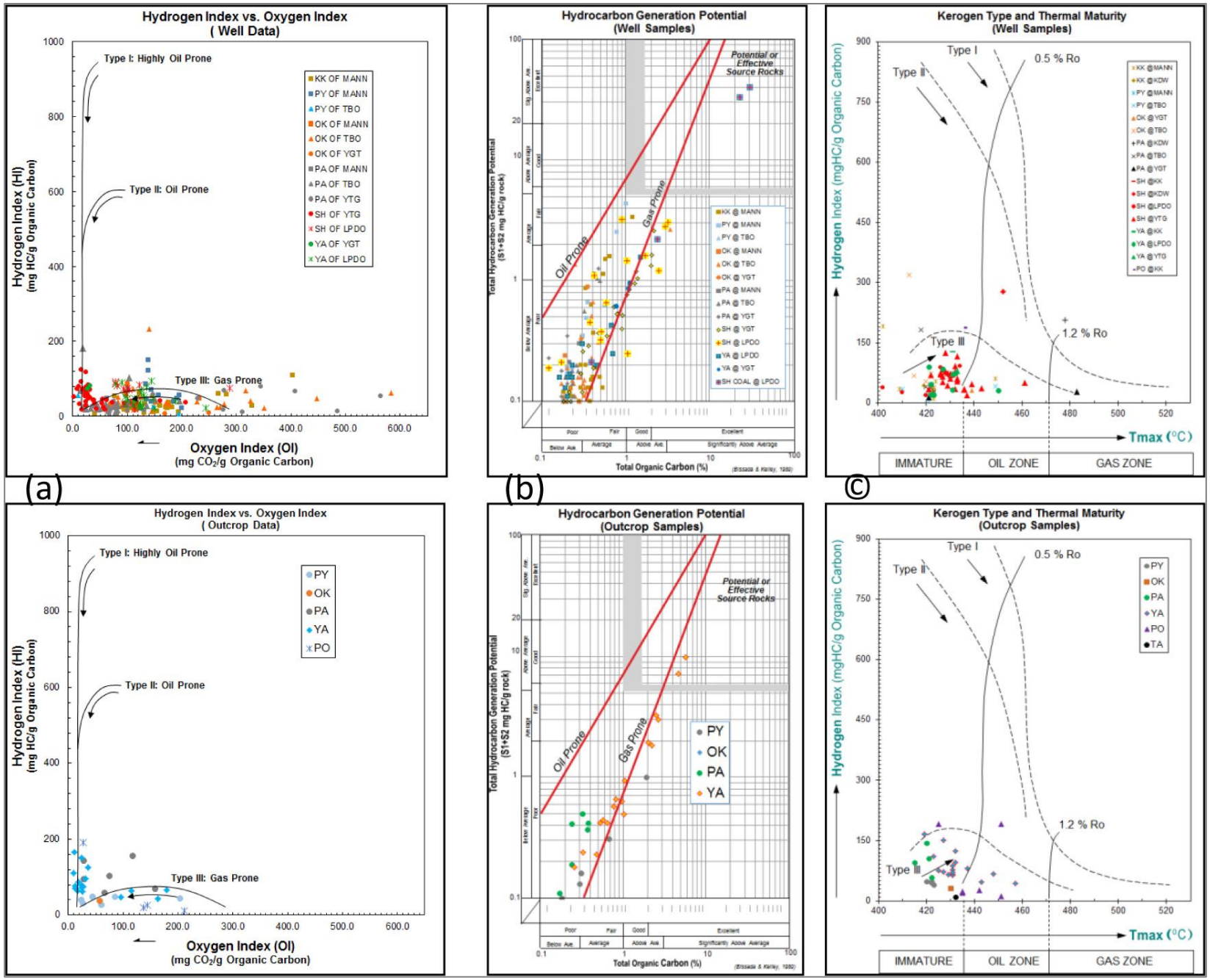

Figure 3. Cross plots of (a) Hydrogen Index (HI) versus Oxygen Index (OI), (b) Pyrolysis S1+S2 versus Total Organic Carbon (TOC), and (c) Hydrogen Index (HI) versus Pyrolysis Tmax showing Kerogen type, Generation potential, and Maturity of sediments in Salin Sub-basin.

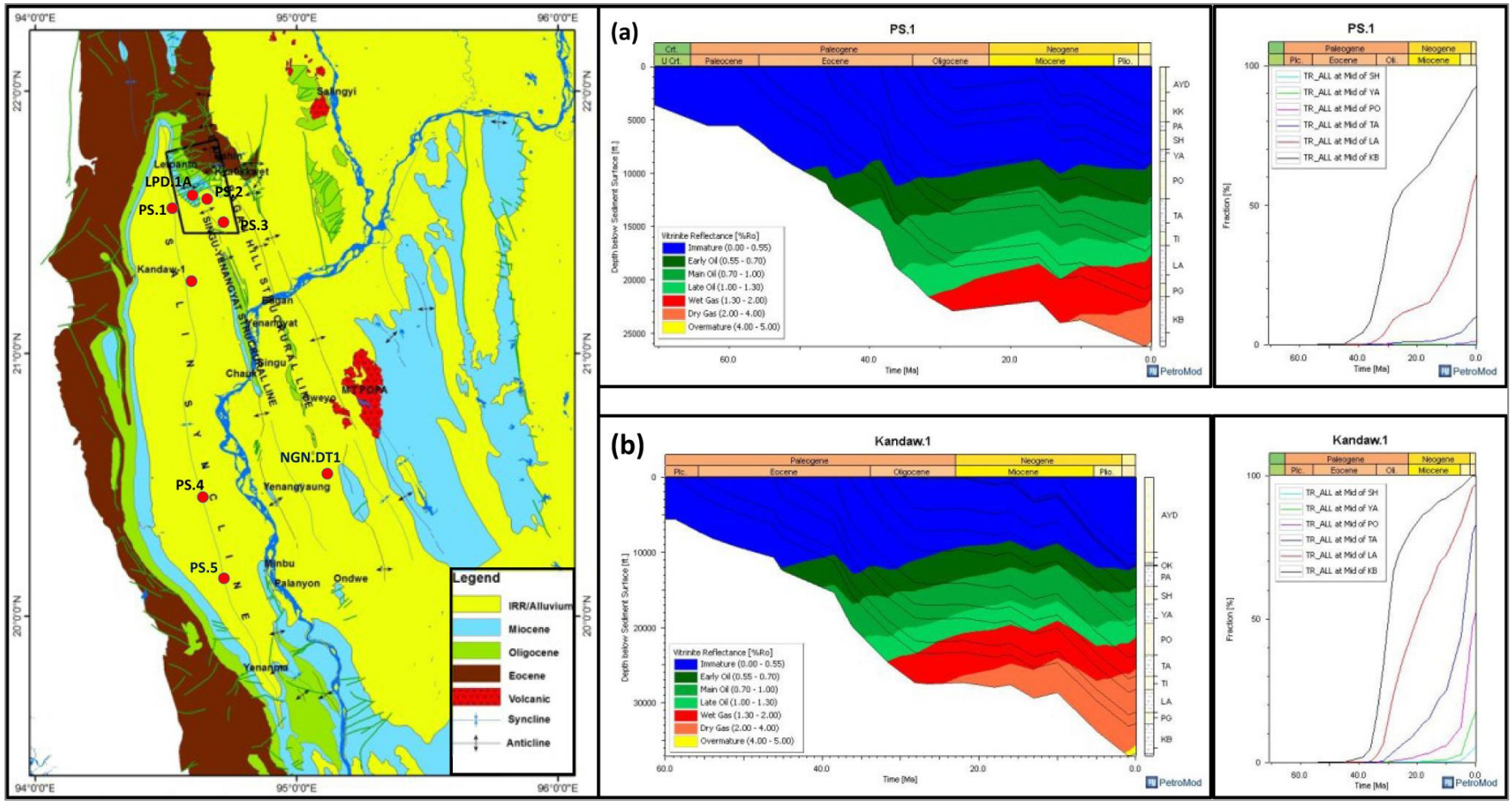

Figure 4. 1D model well location and study results at (a) Pseudo well.1 and (b) Kandaw.1.