**Title: Tectonic setting and hydrocarbon prospectivity of the North Sumatra basin, India and Indonesia**

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**Objective/Scope:**

In this presentation, we use gravity and magnetic data to establish the basin framework for the North Sumatra basin that spans the area north of the island of Sumatra and extending into Indian waters of the Andaman Sea. The specific objective of this study is evaluate westward extension of the new inversion tectonics play that has led to the recent Timpan and Layaran gas discoveries in North Sumatra Basin of Indonesia.

**Methods, Procedures, Processes:**

We compiled gravity, magnetic and published subsurface data to provide an overview of the basin framework in this tectonically complex, plate boundary region.

**Results, observations, and conclusions:**

We show the major structural provinces of the area that can be divided into an active, right-lateral, strike-slip province of Andaman Sea in the west and the inverted rift province of the North Sumatran basin to the east that are separated by the Mergui Ridge. The Greater North Sumatran back-arc rift petroleum province comprises North Sumatra, Mergui, and South Andaman basins and is characterized by a north-south horst and graben system. The age of the rifting is similar to other Sundaland basins, where rifting was initiated in the late Eocene and remained active throughout the Oligocene. Inversion of these rifts of the North Sumatra basin can be related to the Miocene to recent formation of the Sumatran right-lateral strike-slip fault system that includes the formation of a major restraining bend that has uplifted the northern part of the island of Sumatra. The inverted rift province encircles this restraining bend.

Major stratigraphic sequences in the inverted rifts include five to six tectonic episodes are 1) Pre-rift basement, 2) Early and Late syn-rift during the Late Eocene to Late Oligocene (Parabat and Bampoo formations), 4) Post-rift during the Early to Middle Miocene (Belumai and Bampo formation), 4) Syn-inversion during the Late Miocene (Keutapang formation, 5) Post inversion during the late Miocene to Recent.

The East Andaman basin is characterized by transtensional, pull-apart tectonics resulting from oblique plate convergence, while the southern part of the basin is a transpressional setting and shares many characteristics of North Sumatran inversion tectonics.

We show stratigraphic correlations extending from the western strike-slip area into the eastern inverted rift area that include the recent gas discoveries in the Indonesian sector and point out possible source rock and reservoir intervals in both areas. We show that some inverted rift

structures are present within the Indian sector that reflect the same play elements present in the recent Indonesian discoveries.

Recent gas discoveries of Timpan and Larayan wells provide useful analogs in the search for new hydrocarbon plays in the frontier area north and northwest of the islands of Sumatra. The recent Timpan gas discovery is located in a large, anticlinal trap, or “Sunda-style fold” related to Neogene tectonics in the North Sumatran basin. Previous oil production has been limited to the southern part of this basin.

The South Andaman basin and north Sumatra exhibit some common tectonic elements, despite their partial separation by the Mergui Ridge. Our current analysis indicates that inversion tectonics may affect the southern part of East Andaman basin.

**Significance/ Novelty:**

We provide an overview of the hydrocarbon prospectivity of the frontier region of the western area of the North Sumatra basin and the South Andaman basin.

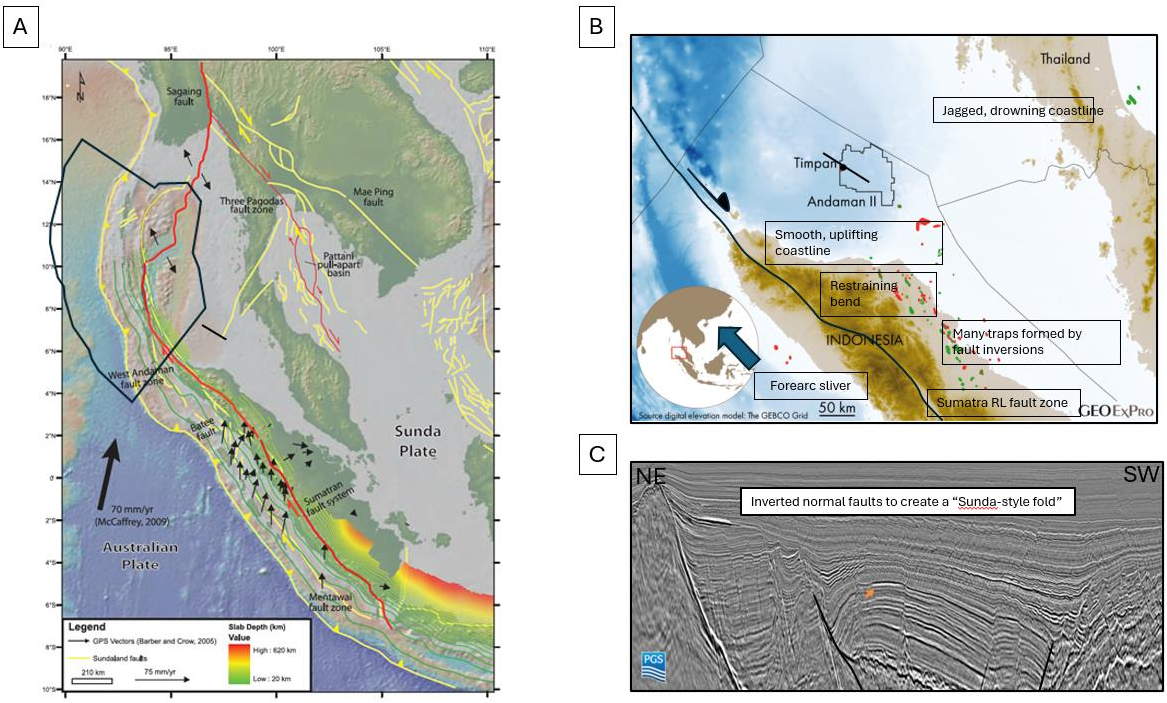


**Figure 1.** **A.** Map showing western part of the largely submerged continental area of Sundaland on the Sunda plate with black box showing the India exclusive economic zone north of the island of Sumatra in Indonesia. Fault in red is the right-lateral Sumatra fault zone that extends northward to form the Andaman pull-apart basin. Black arrows show oblique GPS vectors indicating oblique subduction of the Australian plate. Yellow lines are active faults along the plate boundary. **B.** Map modified from Geoexpro showing the location of the Timpan giant gas discovery. **C.** Seismic line modfied from Geoexpro showing Timpan anticline above an inverted rift.

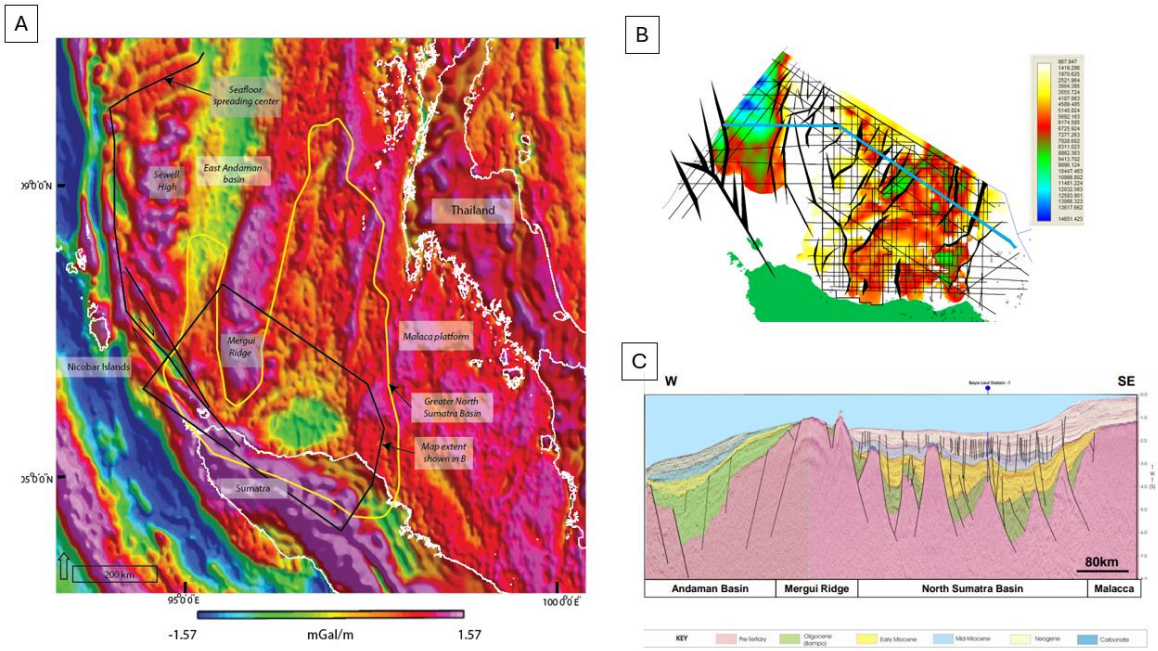


**Figure 2. A.** Bouguer gravity anomaly map showing the crustal structure of the North Sumatra basin with the yellow outline showing the area of the basin affected by Miocene to Recent inversion tectonics. **B.** Structure map of the base of the Cenozoic in feet modified from Vanderelle-Roc (2009) showing the north to northeast trends of rifts. **C.** 2D seismic line crossing the Mergui Ridge showing normal and strike-slip faults striking north and northeast (line is shown as the blue line in B). The uplift of the Mergui ridge is a recent uplift as the stratigraphy is similar on both sides of the ridge.