

Coeval Late Eocene- Early Miocene Extension in the East Andaman Basin and the South China Sea: Geodynamic Consequences and Implications for Hydrocarbon Research.

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Abstract

The South China Sea (SCS) and the East Andaman Sea (EAS) basins are part of a large extensional zone affecting the continental crust around the Sunda block. Formation of these basins is tectonically dependant of the collisions of exotic terrains during the Late Cenozoic, the Philippine Mobile Belt (PMB) into the West, the India sub-continent into the East and Australia into the South.

Understanding the complex geodynamic evolution of this plate junction is the key to build a tectonic and sedimentary model for the basins surrounding Sunda and particularly in this context, the SCS. A good knowledge of the onshore geology surrounding these marginal basins needs also to be integrated to offshore data.

Both EAS and SCS basins show coeval thinned continental crust with presence of oceanic crust in the Eastern SCS only.

In the EAS, Sunda continental crust was stretched mostly during a Late Eocene-Early Miocene dextral NS transtensive episode (Mergui and North Sumatra Basins) pinned northward in the Myanmar Martaban Basin. A regional 20Ma disconformity can be traced all along the EAS with maximum extension into the West. From the Early Mid Miocene to the present this West Sunda continental margin was the site of hyper oblique India/Sunda transpressive wrenching leading to progressive docking and accretion of India Oceanic Ridges sliver terrains now observed in the West Andaman Sea. This tectonic transfer did not affect significantly the EAS 20 Ma seal, offering good opportunities for hydrocarbon exploration in this area.

Along the West side of the Sunda block, in the SCS, continental extension was active during the same period of time (Late Eocene to Early Miocene) along the NS trending dextral East Vietnam Fault. Spreading was also present eastward where EW trending magnetic anomalies were clearly identified and recently drilled from 33 Ma to 20,5 Ma. This main SCS spreading direction suddenly stopped at the same time than the extension in the EAB.

A second SCS spreading or post spreading extension episode trending NE-SW is suspected and still in discussion among the scientific community due to the invasion of Neogene seamount volcanism. This kind of fast change in marginal basin spreading direction is classically observed in other dying spreading centers such as the Shikoku basin in Japan. This could be the result of new segmentation of the recently opened SCS by oblique PMB vs Sunda convergence as dated onshore. This new NE-SW extensional trend in the SCS is also parallel to the Neogene Proto South China Sea (PSCS) subduction zone present southeastward in the Sulu Sea and ending with the Palawan collision 15 Ma.

We think the youngest SCS extension event (20 Ma to 15 Ma) was the result of the last PSCS subduction episode dragged by oblique PMB/Sunda motion.

In this scenario both West and East Sunda block margins were affected from the Late Eocene to the Early Miocene by continental crust thinning just before PMB and Indian Ridges impingement occurred during the early Neogene.

This main extension was controlled by subduction retreat along the Sumatra Java trench and its eastern extension in central Sulawesi.

The challenge is to find preserved hydrocarbon plays sealed by the 20Ma disconformity in both basins. This is relatively simple in the EAB but rather difficult in the SCS where post Early Miocene deformation still persists up to present time.