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ORAL PRESENTATION

A New Direction for Asian Stratigraphy

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Southeast Asia has a long history of stratigraphic studies, not well represented in global literature, a "peripheral isolate" of specialist techniques, such as the Letter Stages that were East Tethyan replacements for European Ages. From this often-overlooked area, characterised by highly variable Cenozoic tropical sediments, in tectonically active basins, might come ideas to assist stratigraphic studies in other, less dynamic areas.

In spite of this promising history, this is mostly an account of a revolution delayed. The development of a reliable geomagnetic polarity time scale [GPTS] during the 1980's (especially Berggren et al., 1985a,b) should have invigorated local studies with an accurate dimension of time, to monitor fluctuating rates of sedimentation, accurately correlate and map out the varying magnitudes of unconformities. However, two factors prevented the modernisation of evidence-based stratigraphic techniques. The first was the adoption of strictly eustatic seismic stratigraphy methods, an effect described in Miall and Miall (2002), imported almost as a package with modern quality seismic acquisition in the Asian region. Secondly was a rapid decline in motivation and innovation from geological service companies, as a result of the commoditisation of professional services; an economic condition known as a Nash Equilibrium. This concept, from game theory, is that every participant adopts a strategy optimised to their best short-term benefit, but in many cases a stable equilibrium is reached where decisions that are good for the individuals can be detrimental for the group; or in this case integrated geological sciences.

The adherence to a strictly eustatic sequence stratigraphic model has faded in most Southeast Asian basin studies in the past few years, simply because it does not fit, and does not predict. However seismic horizons are still given eustatic sequence boundary names, and terms like "3rd Order Cycles" are frequently mentioned in literature. Some passive areas such as the Mahakam Delta can still be force-fitted into a simple fluctuating proximal-distal model that may have some eustatic influences (caveat Miall 1992, 2010), but many basins have simply failed to match geological observations with these model-driven ideas. Most Southeast Asian basins are stratigraphically distinct due to local tectonic influences, and the unique characters of a basin can often affect petroleum systems elements. However, many exploration inputs and riskings are based on over-simple, long-standing assumptions that do not withstand modern tests. Unfortunately, due to retirement and lack of training in specialist skills, the Southeast Asian industry has nearly lost the ability to both apply these tests, and subsequently develop new petroleum systems models.

Several examples are given, selected from areas with long exploration and production histories (East Java and North Sumatra), of such modern tests and the subsequent new stratigraphic frameworks. These have direct impact on risking and ranking of plays, yet-to-find estimates, and may even indicate new plays. Such exploration, off the old creaming curves, is a fiscal requirement for most medium to large operators in the region.

A third example is given from current work by Universiti Teknologi Petronas on Sarawak where a 1980's evidence-based model was abandoned by nearly the whole industry but is now being revived as the methodically tested, evidence-based sequence stratigraphy for not only the Northwest Borneo region, but a keystone for the whole South China Sea. The study area has a dense well data set, good seismic, and is positioned close to tectonic features that leave a stratigraphic record of nearly all the events affecting the South China Sea since the onset of sea-floor spreading near the Oligo-Miocene boundary. This, plus the good age and facies control from the Neogene micropalaeontology, is leading to a detailed stratigraphic model, tested through Walther's Law and tied to plate tectonics. The University is building on the old evidence-based model, neglected in the 1990's, bringing it up to date, developing new work flows, and identifying three and four dimensional stratigraphic characters that had been forced into a 2D sequence model for nearly 30 years.

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