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ORAL PRESENTATION

Integrating Basin Evolution and Plate Tectonics in SE Asia

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SE Asia is the most geologically complex region on Earth due to the three-way convergence of the Indo-Australian, Eurasian and Pacific plates. Unravelling its tectonic and structural history via high resolution plate tectonic modeling is the best way to start to understand this complexity, but how can this be optimised to help exploration?

Most exploration in SE Asia (both for hydrocarbons and minerals) has largely been undertaken empirically, driven by smaller-scale, 'grass-roots', data-intensive exploration that incrementally steps out from the 'known'. These exploration strategies obviate the need to have a good regional geological understanding and are successful up to a point. Can we move beyond 'empirical' exploration in SE Asia into the realm of 'predictive' exploration that unlocks the exploration white-space that remains in the region? For that matter, is there any exploration white-space left? The only way to adequately address these questions starts with a good regional tectonic model that is a base for understanding paleogeography, basin evolution and petroleum systems.

The Geognostics Earth Model (GEM) is a high resolution 4D view of global geology constructed from the bottom-up by interpreting basement terranes and major structures, then spatially reconstructing them back in time by undoing deformation patterns and basin evolution. GEM is particularly detailed in SE Asia; the result of years of collaboration with our clients exploring the region. The model includes high resolution analysis of major plate movement (including the Pacific), as well as more than 200 separately moving microplates. Key features of the model include:

- Progressive rotational extrusion of Sundaland then Indochina driven by the collision of India, opening the main petroleum basins in the Gulf of Thailand and South China Sea in the Late Eocene – Early Miocene.
- A shift in Pacific plate dynamics in the Mid Miocene triggered a major regional readjustment in SE Asia, with East to West convergence causing widespread terrane collision in Eastern Indonesia, the Philippines and Sabah, as well as basin inversion throughout the region.

We have leveraged GEM, along with public domain geophysical data (particularly gravity), numerous publications and interaction with our clients to produce a new regional interpretation of the basins of SE Asia. While in its early stages, our interpretation shows key depocentres evolving through time, qualitatively subdivided by basin thickness and basin type. It forms a powerful base for new paleogeographic mapping, and we show examples of how plate tectonics and paleogeography can be combined to generate new play concepts.

SPEAKER BIOGRAPHY

Jon has a PhD in hard rock structural geology from Adelaide University and more than 20 years' experience consulting across many industry sectors, including oil, minerals, coal, geothermal and wine. A founding member of Frogtech in 2004, he then worked as Global Geological Consultant in Shell for a decade, before founding Geognostics in 2017. He has extensive experience on regional structural geology and basin framework of SE Asia for both oil and mineral company clients.