CERAMAH TEKNIK TECHNICAL TALK

Transverse Segmentation of the Baram Basin and Northern Borneo: An Alternate Model for Oligo-Miocene Subduction

ANDREW B. CULLEN

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Geology Lecture Hall, University of Malaya
(in collaboration with Department of Geology, University of Malaya and UM AAPG Student Chapter)

REPORT

On Thursday 21 February 2008, the Department of Geology welcomed a visit by Dr Andrew Cullen, AAPG Regional Lecturer. Andrew currently works in the Global New Ventures Team for SIEP in Rijswijk, The Netherlands. He has over 20 years experience in the oil and gas business, including 16 years with Shell in roles ranging from production seismology to frontier exploration. In addition to his experiences as a petroleum geologist, Andrew has also worked as a gold prospector, asbestos petrographer, and industrial minerals geologist. His present research focuses on the geological history of Borneo and includes regional tectonics, the palaeogeography of the Crocker fan, palaeomagnetism of the Nyalau Formation, and the petrogenesis of the Usun Apau Volcanics. Andrew is a member of the Geological Society of America and the American Association of Petroleum Geologists. He has served an advisory board College of Geosciences for the University of Oklahoma and currently serves on AAPG's Grants-In-Aid Committee.

In the morning, Andrew gave a lecture on "The Kinabalu Fault and Its Influence of the Distribution of Hydrocarbons in the Greater Kinabalu Field, Sabah, Malaysia" to about 60 undergraduate and post-graduate students of the Department of Geology. In the evening, Andrew gave a thought-provoking and interesting lecture on "Transverse segmentation of the Baram basin and northern Borneo: an alternative model for Oilgo-Miocene subduction" to about 40 students and geoscientists, including some from the oil and gas industry. Andrew offered an alternative model to the tectonic evolution of NW Borneo, challenging the more widely-accepted model of the rifting, drifting and subduction of the South China Sea beneath Borneo. His model showed a series of NW-SE trending transverse zones cutting across Borneo. The talk was followed by active and, at times, rather heated arguments and discussions. The abstract of the talk is given below.

Abstract — The West Baram Line separates the two petroleum systems of NW Borneo. Oligocene sandstone and Early Miocene carbonate reservoirs of the gas-prone Luconia system lie to the SW. This talk examines the oil-rich Baram Basin to the NE, which produces from Middle Miocene to Early Pliocene sandstones. Extensional and inversion structures dominate the shelf where exploration activities spans nearly four decades. Recent discoveries prove this petroleum system extends into deepwater where an active fold-thrust belt has formed above a "lower plate" of attenuated continental crust. New regional structural mapping (~100,000 km2) integrating seismic and well data shows the Baram Basin is segmented into 4 structural domains whose boundaries trend NW-SE similar to the West Baram Line. The basin's largest fields lie on or near domain boundaries indicating they exert fundamental control on the petroleum system. Two domain boundaries project across Borneo as broad zones that correlate with contrasting elements of the onshore geology. When these observations are examined in light of gravity, tomographic, and GPS data, current models for the region's tectonic evolution are called into question. In these models, collision of the Dangerous Grounds following Eocene to Early Miocene SE-directed subduction under NW Borneo drives the Sabah Orogeny. An alternative model is proposed. In this model northern Borneo is largely underlain by attenuated crust, Oligo-Miocene subduction is minimal, and the Sabah Orogeny reflects initiation of NW-directed subduction beneath the Semporna-Dent Peninsula. In this context the Baram Basin is a retro arc foreland basin underlain by a mosaic of deep crustal blocks that partition deformation driven by far-field tectonic stress.

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