

Ceramah Teknik (Technical Talk)

SUNDALAND IS UNUSUAL: WHY YOU SHOULD BE EXCITED TO LIVE THERE!

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Geology Department
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(in collaboration with the Dept of Geology, University of Malaya)

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Report

Dr. Robert Hall and his graduate students have long been involved with research into the regional tectonics of Southeast Asia. They target such issues as the rate of uplift of Mount Kinabalu. Sundaland (the area of continental crust that underlies much of South East Asia and its sea basins) is often described as a "platform", or a "shield", implying that it has been stable for a long period of time. Dr. Hall's talk was aimed at dispelling this widely held notion - according to him, Sundaland is more akin to the Basin and Range Province of the Southwestern United States than it is to, say, the South African or Canadian continental shields. In addition, according to Dr. Hall, undue emphasis has been placed, by most researchers, on the influence on Southeast Asian tectonics of the collision between the India subcontinent and Asia. Instead, he argued, the main influence on Southeast Asian tectonics has been the huge amount of subduction that has taken place. Vast tracts of oceanic crust have, over the years, disappeared under Sundaland's eastern and southern margins.

The talk was well attended. Aside from the usual stalwarts, in attendance were several of Dr. Hall's graduate students, and quite a few geoscientists from the oil industry (due to the efforts of Chris Howells, who manages the KL Explorationists' e-mail list). The post-talk dinner was also unusually well attended, occupying several tables at Sri Paandi's at Jalan Bukit.

Biography

Professor Dr Robert Hall is the Director of SE Asia Research Group and also the Degree Programme Co-ordinator MSci Environmental Geology. His key research topics are SE Asia and SW Pacific Cenozoic Tectonics, Island Arc Evolution Biogeography of SE Asia, Tectonics, climate and tropical sedimentation. He has made many publications over the years on geology and is currently teaching 1st, 2nd, 3rd and 4th year courses in Structural Geology, Environmental Geology, GIS and fieldwork.

He is on the committees and editorial boards of *Tectonophysics* as Editor, *Journal of the Virtual Explorer* and the external evaluator Geology programme at the School of Science and Technology at the University of Malaysia, Sabah. He was also a visiting professor at the University of Hong Kong - Kan Tong - Royal Society in early 2004.

Dr Nur Iskandar Taib

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Abstract

The continental core of Sundaland was largely assembled by the beginning of the Mesozoic, and formed an exposed landmass during Pleistocene lowstands. Because the region includes extensive shallow seas, and is not significantly elevated, it is often assumed to have been stable for a long period. Sometimes it is described a craton. It is not a craton and this stability is a myth.

Sundaland is today surrounded by subduction and collision zones, and merges with the India–Asia collision zone. Cenozoic deformation is recorded in the numerous deep sedimentary basins alongside elevated highlands. Borneo occupies a central position and has a complex history of elevation, deformation and sedimentation often suggested to be linked to India–Asia collision. Some reconstructions interpret a SE Asian block with Borneo at its centre which has been rotated clockwise and displaced southwards along major strike-slip faults due to the indentation of Asia by India.

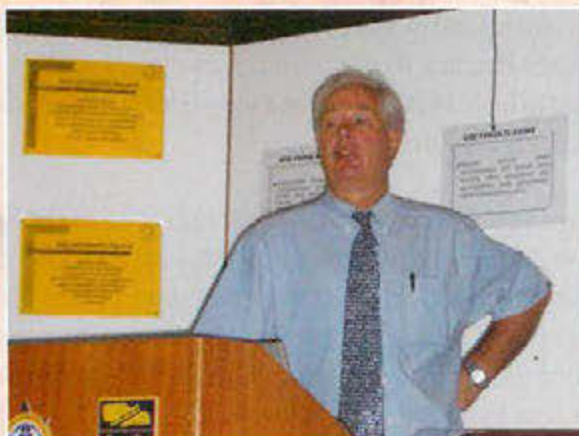
Tectonic influences on the region during the Cenozoic include India–Asia collision, Australia–SE Asia collision, collisions of the Pacific plate/Philippine Sea plate with the Asian margins, and subduction processes. Collisions, backarc extension, subduction rollback, strike-slip faulting, mantle plume activity, and differential crust–lithosphere stretching have been proposed as possible basin-forming mechanisms. In scale, crustal character, heat flow and mantle character the region resembles the Basin and Range province or the East African Rift, but is quite unlike them in tectonic setting.

The geological history of the region is not consistent simply with the movement of large blocks extruded from Asia. Large clockwise rotations and displacements predicted by the indenter model are incompatible with palaeomagnetic evidence and there is no evidence that the major strike-slip faults of the Asian mainland extend into Borneo. Seismic tomography shows a profound change in mantle structure beneath Sundaland. Deep high velocity anomalies interpreted as subducted lithosphere mark the end of Tethys and a different subduction system in the West Pacific. Very great thicknesses of Cenozoic sediments, particularly in Borneo and circum-Borneo basins, were mainly locally derived and not supplied from Asia following India collision. Modern and Late Cenozoic sediment yields are exceptionally high despite a relatively small land area. Long-term high rates of sediment supply imply significant deformation and elevation.

India–Asia collision has not been the major influence on the Cenozoic geological record. Subduction has been the most important driving force; it appears to lead to a different mantle beneath the upper plate associated with a lithosphere which is not like that of older stable continents and their margins. As a result of subduction there is a high heatflow across a region well beyond the immediate areas of the volcanic arcs. There is probably a thin lithosphere and generally a weak crust and lithosphere beneath much of SE Asia, as identified in many other subduction zone backarcs. Deformation in response to changing forces at the plate edges explains the maintenance of relief and hence sediment supply over long time periods.

This is an exciting region which deserves to be better known outside SE Asia. Even geologists who know the region well tend to be overawed by the impact on India on Asia, and/or interpret the region in the light of models derived from elsewhere which may not be appropriate. Sundaland is unusual, interesting and still inadequately understood. The next generation of SE Asian geologists still have a lot to do

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Prof Dr Robert Hall at the talk on Sundaland



Prof Dr Robert Hall with Prof Denis Tan of University of Malaya



Part of the audience at the talk



Part of the audience at the talk by Prof Dr Robert Hall



Part of the audience at the talk by Prof Dr Robert Hall



The President of GSM presenting Prof Dr Robert Hall a memento at the end of his talk