

Continental sedimentation in humid-tropical climates: Impact on Tertiary strata of the South China Sea area, with modern analogues

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Continental deposits in humid-tropical settings are characterized by water-lain fluvial, lacustrine, and marsh facies, in contrast with the depositional models derived from arid and periglacial climates that dominate the geological literature. Resulting stratal geometries are illustrated using modern analogues from Sarawak and Papua New Guinea, and Tertiary strata from the Malay, Natuna, and Sarawak basins. Humid-tropical facies tracts include 1) upper coastal-plain braided stream, coarse-grained meandering stream, and interfluvial paleosols; 2) lower coastal-plain meandering stream and overbank backswamp and lacustrine facies; and 3) deltaic, strand-plain, coastal mangrove swamp, and lacustrine-deltaic facies. In addition, climatic cycles related to Milankovitch cyclicity far more influence stratal architecture in continental facies than does eustatic sea-level fluctuation. Climatic cyclicity may leave palynological "fingerprints" that can be used for high-resolution biostratigraphy.

Tertiary strata in Southeast Asia contain economically important hydrocarbon accumulations reservoired and sourced in strata deposited in humid-tropical continental environments. Source facies formed in cyclic lacustrine and marsh/swamp settings and reservoir rocks were deposited in upper and lower coastal-plain channels, deltaic and lacustrine deltaic settings. Progradational versus "transgressive" phases of sedimentation in lacustrine deposits, and aggradation versus incision in fluvial sediments typically reflect climatic cyclicity. Stratal packaging is also influenced by local tectonics, continental drainage patterns, and other allocyclic forcing mechanisms. Coastal plain to deltaic Lower Miocene strata of Sarawak (Cycle II) and East Natuna (Arang Formation) and syn-rift lacustrine and swamp deposits of the Natuna Basins (Gabus and Lama Formations) contain good examples of strata influenced by these factors.
