INTERNATIONAL EXPLORATIONISTS

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CARLOS A. DENGO—Biographical Sketch

Carlos A. Dengo is a senior research specialist with Exxon Production Research Company in Houston. He received his B.S. in geology in 1976 from Syracuse University, and his M.S. in 1978 from Texas A&M University. He continued at Texas A&M Center for Tectonophysics for his Ph.D., which was completed in 1982. Carlos was given the US National Rock Mechanics Committee award for the outstanding student paper in 1981. His dissertation is titled "Structural Analysis of the Polochic Fault in Western Guatemala, Central America."

Carlos Dengo started his professional career at Exxon Production Research Company in August, 1982, as a research geologist in Fracture and Seal Group. His research interests were on fault mechanics and deformation processes. During 1984-85, he worked for Esso Australia in Sydney on structural styles and fault seals of the Gippsland Basin. On his return to Houston, Dengo studied tectonic and structural controls on source rock distribution. He was promoted to research specialist in 1986. For the next few years, his assignments with different Exxon affiliates included projects on structural styles of Guatemala; structural styles of Marathon-Val Verde Basin, Texas; and tectonics and trap styles of Barents Sea, Norway.

Carlos is actively involved in training Exxon G & G staff around the world in structural geology. He has authored numerous company research reports and published outside. He is an active member of AGU, GSA and AAPG.

STRUCTURE OF THE EASTERN CORDILLERA OF COLOMBIA: A TECTONIC MODEL FOR THE COLOMBIAN ANDES

The tectonic history and structure of the Eastern Cordillera is discussed with a view towards describing 1) trap styles and 2) a tectonic model that relates the Eastern Cordillera to the adjacent Colombian Andes and the entire orogen to the convergent plate margin in the Pacific. The northern Andes in Colombia comprise the Western, Central and Eastern Cordilleras, separated from each other by intermontaine basins. A regional balanced cross section across the Eastern Cordillera shows that uplift of the cordillera on high-angle, basement-involved reverse faults was preceded by thin-skinned deformation, which generated the majority of the structures present within the range.

During the Late Jurassic through Early Cretaceous, a graben system formed in the area presently occupied by the Eastern Cordillera. Late Cretaceous deposition in the region was part of a passive margin that extended across the northern and northwestern margin of South America. Paleogene tectonism along the western South American margin created a foreland basin that extended between the Central Cordillera and the Guayana Shield, including the Eastern Cordillera area. Compressional deformation began in the Eastern Cordillera in Miocene-Pliocene time, characterized by thin-skinned deformation on multiple detachment levels within the Cretaceous section. This deformation rooted in a deep, gently-dipping detachment that extends beneath the Middle Magdalena Basin and the Central Cordillera. Backthrusts splaying from this deep detachment verge west toward the Middle Magdalena Basin. Regional uplift of the Eastern Cordillera deformed belt occurred in Plio-Pleistocene time along basement-involved reverse faults, some of which are inverted Jura-Cretaceous graben-edge normal faults. Basement uplift occurred as strike-slip along the Santa Marta-Bucaramanga Fault was transferred to the Guacaraimo, Soapaga, Boyaca, and other reverse faults. Trap styles are fault-ramp folds that involve one or both potential Cretaceous sandstone reservoirs. Disharmonic folding of Cretaceous shales located between both reservoirs is commonly observed.

Based on a palinspastic restoration of the regional cross section, the amount of shortening across the Eastern Cordillera is about 40%, with 105 km of eastward-directed thrusting and 45 km of westward-directed thrusting. This shortening approximates closely that calculated by summing microplate motions for the northwest corner of South America. Shortening in the cover rocks greatly exceeds that for the high-angle basement-involved faults. The imbalance in shortening can be resolved with a deep, gently-dipping crustal detachment that extends beneath the Middle Magdalena Basin and Central and Western Cordilleras and which roots in the Benioff zone in the Pacific. The mid-crustal detachment model provides a structural link between the three Andean ranges; it provides a mechanism to transmit crustal shortening from the convergent plate margin to the Llanos foreland; it explains the eastward progression of deformation in both space and time; and, it implies that the Colombian Andes have been tectonically transported eastwards a minimum of 150 km.