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THOMAS E. EWING—Biographical Sketch

Thomas E. Ewing is a Research Associate with the Texas Bureau of Economic Geology in Austin. He received a B.S. in geology from Colorado College in 1975, an M.S. in geochemistry at New Mexico Tech in 1977, and a Ph.D. in geology at the University of British Columbia in 1981. He began work with the Bureau in October, 1980.

Prior to moving to Texas, Dr. Ewing was involved in the mapping of a volcanic-filled basin in British Columbia, interpreted volcanic petrologic data, and engaged in regional mapping and tectonic interpretation. At the Bureau, he has been working chiefly with the timing and evolution of Tertiary growth faults along the Texas Gulf Coast. He is also coordinator of a working group for the Tectonic Map of Texas.

Dr. Ewing is a member of AAPG, GSA, and GAC (Canadian), and has served as secretary of the Austin Geological Society.

LATE CRETACEOUS VOLCANISM IN SOUTH AND CENTRAL TEXAS — STRATIGRAPHIC, STRUCTURAL, AND SEISMIC MODELS[1]

Thomas E. Ewing and S. Christopher Caran

Since their discovery in 1915, hydrocarbon traps in and around "serpentine plugs" have produced about 47 million barrels of oil, and have significant potential for additional small discoveries. Production is from isolated reservoirs within mounds of altered volcanic tuff and associated shoal-water carbonates. A review of the more than 200 volcanic centers and intrusive bodies of South and Central Texas has led to development of stratigraphic and seismic models useful in exploration and production.

The so-called serpentine plugs are largely tuff mounds formed by accumulation of volcanic ash (altered to palagonite) on the seafloor around a submarine volcanic vent. Volcanic activity peaked during deposition of the chalk and marl of the upper Austin and lower Taylor Groups (about 80 million years ago). After their eruption, the tuff mounds localized the deposition of shoal-water carbonates with good porosity and permeability. Low-permeability, organic-rich marine shale and marl of the Taylor Group capped the carbonates, serving as both a hydrocarbon source and a stratigraphic seal. Compactional draping of overlying San Miguel and Olmos sands, with minor offset faulting, created important additional traps in South Texas.

Central Texas volcanic centers are highly aligned along strike-oriented regional faults and fractures of the Balcones and Luling systems. The magmas in both Central and South Texas were ultramafic and alkaline, suggesting that partial melting occurred at depths of about 40 miles (60 kilometers). The magma rose rapidly to the surface, probably in an extensional stress regime controlled by pre-Tertiary Balcones-Luling faults.

The palagonite tuff of a typical productive volcanic center has low seismic velocity and is encased in high-velocity carbonates. The strong velocity contrast, coupled with the distinctive shape of the tuff mass, yields a characteristic seismic pattern. Modern seismic techniques, together with stratigraphic data, allow accurate delineation of buried tuff mounds and prediction of productive carbonate facies.

[1] *Publication authorized by the Director, Bureau of Economic Geology, The University of Texas at Austin.*