

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

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Subaerial and Submarine Unconformities and their Correlative Conformities in a Middle Eocene Fluvial, Shallow-Water, and Submarine-Canyon Succession, San Diego, California

Workers previously interpreted Middle Eocene strata north of San Diego as time-equivalent, interfingering formations. We instead interpret multiple sequence boundaries between and within formations.

Landward, a subaerial unconformity separates lagoonal facies of the Delmar Sequence from fluvial deposits of the overlying Torrey Sequence. Basinward, the Torrey becomes estuarine and the contact grades into a correlative conformity. This variation in the sequence boundary indicates that tectonic subsidence increased distally, keeping pace with eustatic fall.

Another unconformity - a submarine sequence boundary - separates the Delmar and Torrey sequences from bathyal units of the Ardath Sequence above. The surface is a 'sand-on-sand' contact, occurring within a single lithostratigraphic formation. It represents a plucked and stepped submarine-canyon floor, with injection, pry-ups, intraclast-filled scours, and erosional protrusions. Basinward, the sequence boundary cuts out the Delmar and Torrey sequences, placing deep-water deposits onto a kaolinitic paleosol which caps the Mount Soledad Sequence. Tectonic oversteepening probably controlled development of this unconformity.

A second submarine sequence boundary occurs within the canyon, eroding into the Ardath Sequence and dividing it from the overlying Scripps Sequence. This surface is a 'mud-on-mud' contact. Large slump blocks line the unconformity and represent canyon rejuvenation. Fan deltas probably prograded into and loaded the canyon head during falling sea level, initiating the mass wasting.

Thus, variable rates of subsidence, eustasy, and sedimentation along this tectonically active forearc margin created diverse nonmarine and marine unconformities and correlative conformities. Such variations in these surfaces are not adequately depicted in published sequence stratigraphy models and need to be incorporated.