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

Lyndon A. Yose[1], J. F. Collins[1] (1) ExxonMobil Upstream Research, Houston, TX

Windward-Leeward Models for Carbonate Platforms Revisited

Carbonate sediment supply and dispersal are primary controls on platform development and are strongly affected by atmospheric and oceanic circulation patterns. For example, Bahamian platforms show that prevailing winds have a significant effect on cross-bank sediment transport and platform margin geometries. In general, windward margins are reef dominated with aggradational geometries, and leeward margins are carbonate sand and mud dominated with progradational geometries. These models provide valuable predictive tools that, in combination with sequence-stratigraphic concepts, are often used to infer reservoir quality and architecture for ancient platforms in the subsurface. However, observations from ancient platforms show that windward-leeward controls on platform geometry and reservoir quality distribution are variable. Some examples include: 1) variations in physical energy flux around platform margins that are inconsistent with paleo-wind orientations; 2) non-systematic reservoir quality development in association with windward-leeward position; and 3) variable platform geometries (e.g., progradation on windward margins, retrogradation on leeward margins). Such variations occur in response to a number of extra- and intra-basinal factors that impact atmospheric and oceanic circulation patterns, and the response of the carbonate system. Extra-basinal factors include plate tectonic setting and temporal variations in carbonate systems resulting from changes in biota, climate, and eustatic patterns. Intra-basinal factors include basin size and shape (e.g., open ocean versus cratonal seaway), geometry and spatial distribution of platforms, accommodation history, and diagenesis. These factors combine to produce a range of temporally and spatially variable windward-leeward models for carbonate platforms with different reservoir implications.