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Stranded Carbonate Slope Deposits: Allochthonous or Autochthonous? Evidence from Basin Outcrops in the Wolfcampian (Permian), West Texas

The origin of slope-to-basin restricted shingles found worldwide along many carbonate platforms, remains controversial. West Texas outcrops of Wolfcampian (Permian) carbonate platforms provide an excellent opportunity to study the spatial relationships of restricted shingles with adjacent shelf margins and basin settings. Each restricted shingle is less than 20 m thick and its internal architecture is typified by stacked meter-scale, high-frequency cycles composed of medium to thinly bedded fusulinid-crinoid wackestones that grade up into fusulinid and peloidal grainstones. Breccias are particularly conspicuous toward the top of the shingles. Two important surfaces punctuate these shingles: the lowermost is an erosional discontinuity that overlies truncated slope and basin facies while breccias and dissolution pipes characterize the upper discontinuity. These detailed observations suggest an autochthonous origin for these shingles; each restricted shingle represents a younger platform forced to downstep and offlap basinward of the main platform during a period of relative sea level fall. During this period, the carbonate factory continued to exist along scours in the slope and simultaneously shed significant amounts of sediments to deeper parts of the basin (gravity flows). These scours or lower discontinuities are interpreted to be the result of storm- and fair-weather wave base erosion of the slope; as base level continued to fall shingles were exposed and karstified (upper discontinuity). The resulting stratigraphy is a series of stranded carbonate platforms encased in deep water facies that could represent important stratigraphic hydrocarbon traps in addition to their time-equivalent gravity flow deposits.