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Changes in Depth of Incised Valleys Within a Transgressive Sequence Set of the Albian Bow Island Formation, Southwest Alberta—Implications For Sequence Stratigraphic Models

The upper member of the Bow Island Formation is comprised of a complex transgressive coastal succession overlying a major basinwide unconformity, and overlain by Westgate marine shales. Integration of sedimentology, micropaleontology, ichnology and petrophysical well log characteristics enabled identification of five high order sequences within this 15-20 m thick succession. Sequence boundaries are marked by basinward shifts of facies, incised valleys and soil development. Transgressive surfaces, often developed as prominent, pebble-mantled ravinement surfaces, subdivide each sequence into a lower and an upper unit. Deposits overlying the transgressive surfaces show a stepwise change towards more open marine conditions following each transgression, from marginal marine tidal flat and lagoonal deposits to shoreface and finally to shelf deposits. This demonstrates stacking in a retrogradational sequence set, deposited during a period of overall sea level rise punctuated by relative sea level falls. Erosion associated with the transgressions increases upward in intensity with each successive transgression reflecting an upward increase in energy regime of the sedimentary environments that bypassed the area during the transgression. A landward decrease in the depth of erosion was also observed along individual transgressive surfaces. More importantly, in an upward direction the depth of the incised valleys increases with each successive incision event. This reflect an upward increase in depositional relief related to a combined effect of a) the overall aggradational and retrogradational character of the upper Bow Island member, and b) the upward change from a low relief tidal flat setting to a shoreface setting characterized by steeper depositional gradients.