

Cycles of shelf-edge construction and destruction, Eocene Santos Basin, offshore Brazil

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Eocene strata from the northern Santos Basin, offshore Brazil include shelf-edge clinoforms that record progradation of the basin margin into a slope mini basin. Analysis of four depositional sequences imaged in industry-grade, three-dimensional seismic data reveals complex spatial and temporal patterns in shelf-edge accretion, catastrophic failure and reestablishment, all of which contribute to basin-margin progradation. For each sequence, shelf edge development is defined by four distinct phases: 1) progradation of the shelf-edge defined by offlapping clinoforms characterized by shelf-attached turbidites and strike-fed sediment drifts recognizable in surface amplitude maps. These systems deliver limited sediment volumes to the basin floor as turbidites during the lowstand; 2) aggradation of the basin margin, transgression and back stepping of the point of onlap of shelf and slope strata; 3) catastrophic shelf-edge collapse during the highstand causing up to 15 km long, 0.5km wide sections of the outer shelf to collapse and be deposited on the lower slope as mass transport complexes (MTCs). These MTCs are defined by stacked lobes and basinward vergent thrusts of what are interpreted as slump deposits; and 4) healing of the collapse scars and irregular bathymetry of the MTC packages and subsequent progradation of the basin margin. Although the majority of turbidites delivered to the basin floor in this area were transported during lowstand, the largest volumes of basin-floor deposits were deposited during highstand, being derived from highstand shelf-edge collapse. Analysis of the Eocene strata of the northern Santos Basin sheds light on the depositional system scale development of a basin margin that adds to an increasing number of examples that show inconsistencies with conventional sequence stratigraphic models.

Keywords: clinoforms, mass transport, sequence stratigraphy, turbidites