Cyclic Depositional Processes on a Mixed System in Northern Campos Basin, SE Brazil

Abstract

A new mixed turbidite-contourite system is described in the northern Campos Basin, southeastern Brazilian margin. This system is developed in a middle slope setting and was formed through non-synchronous interaction between the turbidity current and a contour current in the same stratigraphic interval (Miocene). Different depositional cycles were accounted based on their diagnostic seismic features. Seismic attributes, seismic facies, and isochron maps were used to identify alternating cycles of downslope and alongslope processes in the study area, along with the intermediate stage with features from both processes (mixed system). The depositional processes resulted from alongslope current activity can be distinguished from the downslope current activity, based on the acoustic characteristics (root-mean-square (RMS) amplitude), internal architecture, and external geometry pattern. While alongslope currents deposits consist of mainly low RMS amplitude values clinoforms with an alongslope trend; the downslope gravity deposits present high-amplitude or chaotic seismic facies, usually higher values of RMS amplitude, channel or channel-lobe features, erosive surfaces, and a basinward depositional trend. In this study, five seismic units are described and later associated with their dominant type of current. Based on the main depositional diagnostic features, it was possible to determine which were the dominant processes that controlled the sedimentation by indicating periods where the margin was mostly submitted to sediment transfer from continent to the basin and periods where the oceanic currents prevailed by redistributing sediments along the isobaths and replacing the axis of downslope transfer conduits. Important information on the paleocurrents' direction was also made based on the final deposits display (e.g. terraces, sediment waves, paleochannels), a northward-flowing bottom current was assumed. Research on alternating dominant processes and mixed depositional systems may provide a better understanding of deep-water depositional processes. Because these processes do not always fit previous depositional models that are mainly described for synchronous systems, new insights on cyclic non-synchronous mixed systems can improve our understanding of how mixed systems are organized through time and space. Setting new models on cyclic deposits and intermediate stages can have a future economic impact on potential hydrocarbon reservoir architecture.