Geophysical Research Abstracts
Vol. 20, EGU2018-2804, 2018
EGU General Assembly 2018

Morphology and evolution of basin-margin clinoform growth, Cuyo Group, Neuquen Basin; Seismic examples enhanced by outcrop observations

Maria Laura Loss (1), Walter Brinkworth (1), Griselda Vocaturo (1), Cornel Olariu (2), and Ronald Steel (2)

(1) YPF S.A., Geosciences, Buenos Aires, Argentina , (2) Jackson School of Geosciences, University of Texas, Austin, United States

The Lower to Middle Jurassic sedimentary fill of the Neuquen Basin in Argentina is characterised by the basinward progradation of well-developed shelf-margin clinoforms that link deep-water fans, muddy slopes and shelf-delta systems. We document the basin-scale, seismic clinoforms (amplitude: 4-700 m), as well as the seismic morphology of component shelf-edge deltas, deep shelf-edge incisions, slope channels and basin-floor fans, using also coeval outcrop analogs in the same region. We thus build an integrated model of a typical Cuyo Group clinoform and clinoform set in two main depocenters within the basin. This led to improved understanding of the evolution of clinoform morphology and established different stages of basin infilling.

A regional interpretation of the subsurface seismic and well-log data allowed the definition of a time series of 10 seismic units with variable dimensions from north to south. A single seismic unit (clinoform set) is a conformable stack of clinoforms exhibiting clear topset-foreset-bottomset morphology, though some foresets may be partially truncated by topsets. Mapping of different shelf-edge positions through time, the shelf-edge trajectory, enabled a prediction of sediment-volume partitioning along the clinoformed successions. Seismic geomorphology allowed identification of canyons and channels on the shelf margin, and mapping showed their evolution downslope into basin-floor fans.

Paleoenviromental and lithology/facies data from nearby analog outcrops were used to populate the seismic model. In the outcrops of La Jardinera, SW Neuquen Basin, there is clinoformal continuity between the deepwater basin-floor, slope mudstones and shelf deposits, showing a pattern equivalent to the seismic geometries. Height and age of clinoforms both in outcrop and subsurface are comparable thus allowing facies model extrapolation. Using megapans, drone photography and measured sections the following main facies associations are identified in the clinothems: (1) Shelf: regressive sandy conglomeratic fluvial channels and delta-front sandstones; transgressive tidally reworked mouth bars, estuarine tidal bars and thick (5-15m) sheet-like mudstones; (2) Shelf Edge: delta-front sandstones incised by deep conglomeratic and sandstone channel belts; muddy or tidally reworked sandstones in inter-distributary areas; (3) Deepwater Slope: mudstones, thin-bedded, inclined levee sandstones, turbidite sandstone-filled channels; (4) Basin Floor: stacked turbidite sandstone lobes and occasional debrites forming 100m-thick basin-floor fans.

Two main areas with different supply, subsidence and clinoform-dimension characteristics are described and mapped. The southern depocenter has relatively steep (3-4°) and high-amplitude (4-700m) clinoforms, the shelf-edge is at times strongly incised by clustered channels (100s of m deep) and the basin floor exhibits thick fan deposits. Conversely, the northern depocenter has gentle dipping clinoform refectors (2-3°) with modest amplitudes (3-400 m) and are also punctuated by slope canyons that connect with moderate sized fans downslope. The evolution of clinoform morphologies in each depocenter allows recognition of three main stages of basin infilling. Some contrasts between the two areas suggest different roles for accommodation (sea-level and subsidence changes) vs sediment supply (relief and catchment area) as controlling factors on basin margin clinoform formation.