Stratigraphic Evolution of a Cretaceous Mixed (Turbidite-Contourite) System: The Polonio Drift System (PDS), Uruguay

Adam Creaser[1], Fransisco Javier Hernandez-Molina[1], Philip Thompson[4], Gianluca Badalini[5], Matias Soto[2], Bruno Conti[3]

[1]Earth Science, Royal Holloway, Egham, Surrey, United Kingdom.
[2]Instituto de Ciencias Geológicas , Montevideo, Uruguay.
[3]ANCAP, Montevideo, Uruguay.
[4]Shell, London, United Kingdom.
[5]Shell, Kuala Lumpur, Malaysia.

ABSTRACT

Deep-water deposits continue to provide major targets for oil and gas exploration. Despite an increasing catalogue of reservoirs suggesting the interaction of multiple processes, mixed-systems still remain significantly understudied. While these are highly prospective in terms of their reservoir quality, they often host anomalous geometries and internal stacking characteristics which do not conform to traditional turbidite-models, but can offer additional information about the changing roles of sedimentary processes through geological time. Using a 13,500 km2 3D seismic survey from the Uruguayan Margin, we highlight three major evolutionary stages in the growth of the margin: 1) Onset, 2) Drift growth and 3) Burial. The onset stage is dominated by two packages of sediment waves, 30km wide and up to 500 m thick on the lower-slope, which are fed by two major sedimentary input points, to the N and S of the Polonio High. Both follow underlying basement features, running along general S/SE trends, and amalgamate basinward towards the SE. During the growth stage, four large (>25 km wide and up to 100 km long) asymmetric channel-drifts prograde obliquely (90 – 120o) away from the palaeoslope for over 100 km. Individual drifts have maximum thicknesses of up to 1km at drift crests, though thin to less than 100 m in channels, composed internally of convex-up, low to medium amplitude reflections which prograde/aggrade generally from N-S. Along the steep (SW) limbs, localised MTDs highlight instability on stoss slopes of drifts, which were eroded or reworked by subsequent turbidity flows. Following the termination of delta progradation along the shelf, drift growth terminates and is buried by a laterally continuous, low-amplitude drape which reaches its maximum thickness over underlying channels, though thins to several hundred metres over underlying drift highs. Vertically, these become higher amplitude and associated with minor erosional discontinuities, furrows and a flattening of the middle-slope, suggesting the intensification of bottom-currents. Similar deposits have also been identified across the present day margins of the Antarctic Peninsula and Weddell Sea, where unconfined down-slope flows are pirated by bottom-currents, leading to alternating turbidite or contourite-dominance on levees and ‘cleaned’ channel-sands. Significant work is still needed to fully understand the mechanics behind deep-marine process interactions and their associated deposits.