Architecture of Deep Water Lacustrine Fans Fed by Multi-directional Clinoforms in Dacian Basin, Romania

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ABSTRACT

Models for lowstand and highstand basin-floor fans are well known from multiple studies on modern and ancient basin margins. In this study an additional complexity is added to basin floor fan architecture where sediment is fed into the basin from multiple directions oriented at high angles to each other. Late Miocene clinoforms (400-550 m thick) are easily recognized in 3-D seismic data of western Dacian Basin, a para-Tethys basin in Romania. The clinoforms are difficult to recognize in well logs correlations but easily imaged in seismic data where a 100-150 m thick lower fan interval with coarse sandy deposits are overlain by 250-300 m thick muddy deposits and capped by 50-100 m thick sandy deposits.

Depositional systems on shelf, shelf edge, slope and basin floor were mapped on seismic data and also recognized on well logs. The Dacian Basin was a closed basin hundreds of kilometers across with clinoforms prograding from multiple directions toward its center. 3-D seismic data combined with five strike-oriented and three depositional dip-oriented well-log cross-sections are the main tools to investigate basin-floor fans architectures. SP and resistivity logs of over 200 closely (~300 m) spaced wells have been correlated over an area of thick basin floor fans.

The mapped fan thickness in the area (10x20 km) with dense wells is about150 m and the fan deposits can be followed on the seismic data for hundreds of kilometers. The fans are composed of 10-30 m thick, stacked sandstone units interpreted as fan lobes. The lobes have complex sandstone distributions with coarsening or thinning upwards, blocky or ratty log patterns. Individual lobes extend from the lower slope and onto the basin floor. In the 'distal' area of one clinoform set the fans have thicker sandstone as these represent lobes formed by sediment shed from a different segment of the basin margin.

Multiple deep-water fans coalesce onto the basin floor to create thicker than normal sandstone bodies but with complex internal architecture. We are able to document sandstone lobes with different orientation and variable thicknesses through time, as these are linked with variable rates and directions of basin margin progradation. As a consequence of the multi-directional fed fan model, new plays and prospects with unusual fan configurations can be imaged.

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