Abstract

The models for lowstand and highstand basin floor fans are well known from multiple studies. In this study an additional complexity is added to basin floor fan architecture where sediment is fed to basin floor from multiple directions. Late Miocene clinoforms (300-450 m height) are easily recognized in 3-D seismic of western Dacian Basin, a para-Tethys basin in Romania. The clinoforms are more difficult to recognize in well logs, but in seismic data a 100-150 m thick lower interval with coarse sandy deposits overlain by 150-200 m thick muddy deposits and capped by 50-100 m thick sandy deposits, is well imaged. 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 with clinoforms prograding from multiple directions toward its center. 3-D seismic combined with five strike-oriented and two depositional dip-oriented well cross-sections are the main tools to investigate basin floor fans architectures. SP and resistivity logs of some 400 closely spaced (~300 m) wells have been correlated over an area of thick basin floor fans. The overall fan thickness is >200 m and the fans can be followed on the seismic data for hundreds of kilometers. The fans are composed of 10-30 m thick sandstone units interpreted as fan lobes. The lobes have complex sandstone distributions with coarsening or thinning upwards, blocky or ratty log patterns suggesting variable facies. Individual lobes extend from the lower slope and onto the basin floor. In the ‘distal’ area of one of the clinoforms the fans have thicker sandstone as these represent lobes formed by sediment shed from a different segment of the basin margin. Multiple directional deep water fans coalesce 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, new plays and prospects with unusual fan configurations are described. There are no recognized hydrocarbon deposits in the described fans but elsewhere in the basin, equivalent age deposits form reservoirs.
1. Abstract

The models for Amundsen and Enderby basin floor fans are well known from multiple studies. In this study an additional complexity is added to basin floor fan architecture where sediment is fed to basin floor from multiple directions. Late Miocene clinofoms (300-450 m depth) are easily recognized in 3-D seismic of western Dacian Basin, a para-tethys basin in Romania. The clinofoms are more difficult to recognize in well logs but in seismic data a 150-150 m thick lower interval with coarse sandy deposits overlies by 150-200 m thick muddy deposits and capped by 10-100 m thick sandy deposits, is well imaged. 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 with clinofoms prograding from multiple directions toward its center. 3-D seismic combined with fine strike-oriented and two depositional dip-oriented well-cross sections are the main tools to investigate basin-floor fans architectures. SP and resistivity logs of some 200 closely (~300 m) spaced wells have been correlated over an area of thick basin floor fans. The overall fan thickness is >200 m and the fans can be followed on the seismic data for hundreds of kilometers. The fans have been correlated over an area of thick basin floor fans.

2. Location

Dacian Basin is the area between south of Lower Danube River to the Southern Carpathians and to the east of the Eastern Carpathians basin; it is bounded to the west by the arc-shaped mountains of the transition between the Carpathians and the Ballakeh Mts. Dacian Basin is separated from the Black Sea by the Dobrogea high. Therefore, the Dacian Basin is almost surrounded by mountains and also source of sediment (Jipa & Olariu, 2008 (Figure 1 & 2). The Paleogeographic con-...
Architecture of Deep Water Lacustrine Fans Fed by Multidirectional Clinoforms in Dacian Basin, Romania
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7.1. Result - Correlation Sections
Well correlation is based on flooding surface. Seventeen flooding surfaces are defined using SP and resistivity log. The oldest flooding surface is FS 1 and the youngest flooding surface is FS 17. Some features are highlighted as arrows on well sections to emphasize the log characteristic of fan lobe (Figure 16).

7. Result - Maps
Isochore maps and net sand thickness maps are generated for each fan lobe between two flooding surfaces (Figures 17, 18). Isochore and net sand thickness show similar trend. The direction of sediment feed is also interpreted using net sand maps. The arrows represent the feeding direction. Each fan lobe has different feeding direction that can be happened due to Dacian Basin are surrounded by mountain belts and the clinoforms prograde from multiple directions.

- Well logs characteristics are overlaid on net sand map (Figure 19) shows various log characteristic in different part of fan lobe. The future study will try to interpret sub-depositional environment on fan lobe by these characteristics. The shape of fan lobe and sand distribution are also considered to be a part of this interpretation.
8. Conclusion

The present of clinoforms suggest that the stratigraphy is not layer cake model in this basin. Seismic and well logs confirm that the Dacian Basin is a closed source-to-sink sediment system with clinoforms prograding from multiple directions toward the center. The thick bottomsets (basin floor fans) are the result from meagre topsets and a strong shelf edge progradation. The overall fan thickness is over 200 m and the fans can be followed on the seismic data for thousands of square kilometers. The fans are composed of 5-25 m thick sandstone units interpreted as fan lobes. The lobes have complex sandstone distributions with coarsening or thinning upwards, blocky or ratty log patterns suggesting variable facies and depositional elements. Some peculiar fan geometries might emerge such the observation that in the ‘distal’ area of one clinoform, the fans have thicker sandstone as these represent lobes formed by sediment shed from a different segment of the basin margin. The amalgamation of fan lobes are expected to present in any closed source-to-sink basins.

9. Discussion

Top of basin floor fan are marked in black and bottom of fans are in white. Seismics lines show clinoforms prograded from multiple directions as marked by yellow arrows. The relative age of clinoforms are defined in seismic section that show more than one direction of prograding. In seismic line B, clinoforms prograde from both west and east side but clinoforms from the west are overlying on clinoforms that prograded from east side. Therefore, we assume that the relative age of clinoform are 1, 2 and 3 chronologically (Figure 21). Figure 22 shows amalgamation of bottomsets of clinoforms in seismic line B and the schematic drawing of amalgamated clinoforms.

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