The tectono-sedimentary evolution of the Kamchia Depression, Eastern Bulgaria: implications for prospectivity

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The Kamchia Depression is the westernmost onshore part of the Balkan Foredeep in Bulgaria. It has a history of petroleum exploration and production going back to the 1940's with numerous wells drilled, often before seismic. To date gas production has been limited but there have been numerous shows of gas and gas condensate from Tertiary and late Mesozoic reservoirs. The focus of this work has been exploration of Palaeogene turbidites deposited prior to, during and after the emplacement of the Balkan thrust sheets. Legacy well data shows numerous thick and porous sandstone units, many of which flowed gas but were not developed or were drilled prior to seismic acquisition and were not drilled in optimal positions.

The distribution of reservoir sands has been enigmatic, with rapid changes in facies and thickness presenting a major risk in ongoing exploration.

In this presentation we present a re-evaluation of the tectono-stratigraphic evolution of the Kamchia Depression based on the analysis of a recent onshore 3D survey, coupled with re-evaluation of well, geochemical, field, core and 2D seismic data. The aims of this study were to understand and predict temporal and spatial distribution of mid-upper Eocene reservoir, seal and traps.

On the southern margin of the Kamchia Depression, the Balkan Thrust slices were emplaced rapidly in the Middle Eocene, generating a narrow deep-water synclinal basin which deepened towards the Black Sea. As a result, there is a major change in basin architecture from the early Eocene, where a more widespread foreland basin system is thought to have been present, to the late Middle Eocene, when the foredeep became very narrow. Throughout the late Middle and Late Eocene rapid deposition of axially flowing turbidite systems in-filled this basin, accompanied by minor tectonic tilting and the development of oblique slip fault systems. These turbidite systems were deposited rapidly as a series of thick constructional channel-levee systems which off-lapped one another. This depositional system progressively onlapped the emergent Balkan thrusts belt to the south. The distribution and architecture of channel and overbank sandbodies is complex. Petroleum traps depend on stratigraphic pinch-outs, displacement of sands along NE SW trending oblique slip faults and fault/stratigraphic combination traps.