

Structural and depositional evolution of the Eastern Balkan thrustbelt, Bulgaria

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Structural and sedimentological data from onshore outcrops, offshore wells and offshore seismic profiles indicate that the thrustbelt geometry in Eastern Bulgaria from the Paleocene to the Recent is characterized by a southeastward plunge toward the Western Black Sea basin. This plunge was caused by: 1) a combination of eastward-thinning continental crust in the west, and oceanic crust in the east; 2) post-rift thermal subsidence of the continental crust; 3) buttressing and no buttressing of the thrustbelt against the Moesian Platform in its western and eastern portions; and 4) northeastward thrustbelt advance. These factors controlled the eastward-diminishing uplift of the thrustbelt and eastward sediment funneling into the Black Sea.

Evidence for the eastward-fading uplift and buttressing includes: 1) eastward decreasing amount of shortening along constructed cross sections, yielding 30km, 10.5km, 11km and 4km from west to east, respectively; 2) eastward trend of more complete stratigraphic sections and shallower erosional levels; and 3) eastward increase in décollement depths, being 3.7km, 3.8km, 9.5-13.5km and 12.3-14.1km. The age of the last thrusting is progressively younger toward the east from Middle Eocene through Late Eocene to Oligocene from west to east, respectively. Onshore parts of the thrustbelt, which were significantly affected by buttressing against the Moesian Platform, exhibit thrusting followed by Late Eocene gravitational collapse, Oligocene quiescence and Neogene extension. The thrustbelt portion further east exhibits thrusting followed by Oligocene-Neogene extension. A Paleocene-Middle Eocene piggyback basin formed in the onshore portion of the thrustbelt, centered in the East Balkan Zone, with a southeastward plunging axis, which migrated northeastward with basin shortening and filling.

Development of the East Balkan thrustbelt and its later extensional modification had a dominant control over sediment transport, lithofacies, and depositional patterns. Developing thrustbelt fold structures, together with the orogenic hinterland and highs in the foreland, formed a northeastward and eastward expanding system of sediment input. Southeastward plunging axes of the foreland basin and the Paleocene-Middle Eocene piggyback basin were the principal sediment transport pathways, together with subordinate internal synclinal axes. These depressions funneled sediments toward and into the Western Black Sea basin. As orogenesis advanced to the northeast, former depositional areas were uplifted and eroded, providing local sources of sediment.