Tectono-sedimentary evolution of the Upper Cretaceous – Middle Eocene Central Anatolian Basins, Turkey

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The Black Sea lies at the northern margin of an orogenic belt assembled during the closure of the Neo-Tethys Ocean. Knowledge of the nature and timing of Neo-Tethyan closure aids in understanding regional compressive deformation in the Black Sea region. In central Turkey, a strand of the former northern Neo-Tethys Ocean subducted northwards under the Pontide active margin during Cretaceous – Early Cenozoic time as the Black Sea basins opened. Subduction generated accretionary complexes and emplaced ophiolites onto the former passive margins of microcontinents. The resultant suture zones contain Upper Cretaceous - Middle Eocene basins including the Kırıkkale, Haymana, Tuz Gölü and Çankırı basins.

The basins' basements comprise the Ankara Mélange, a mainly Cretaceous accretionary complex and the western margin of the Niğde – Kırşehir Massif, an inferred microcontinent. New geochemical data from the Kırıkkale Basin has identified mid ocean-ridge basalt (MORB), here interpreted as Upper Cretaceous Neo-Tethyan oceanic crust. During the latest Cretaceous, the Kırıkkale and Tuz Gölü basins formed in deep water on MORB crust, bordered by the Niğde – Kırşehir microcontinent to the east where marginal facies accumulated. Further west, the Haymana Basin is an accretionary forearc basin constructed on the Ankara Mélange. The Çankırı Basin developed on accretionary mélange, bounded by the Pontide active margin to the north. Palaeocene sedimentation was dominated by marginal coralgal reef facies. Latest Palaeocene – Middle Eocene facies included shelf-type Nummulitid limestone, locally deposited on unconformity surfaces.

Using stratigraphic logging, geochemistry, palaeontology and provenance studies, we have tested two tectonic models of basin evolution. In one model, basins formed on obducted ophiolites following the closure of a single northern Neo-Tethys Ocean during the Late Cretaceous. In the other model, basins evolved in a forearc setting associated with northward subduction which lasted until the Middle Eocene. We propose a new model in which two north-dipping subduction zones were active during the late Mesozoic in northern Neo-Tethys. In the south, ophiolites formed above a subduction zone consuming the Inner Tauride Ocean until the southward retreating trench collided with the northern margin of the Tauride continent emplacing ophiolites. In the north, subduction initiated outboard of the Eurasian margin triggering genesis of supra-subduction zone ophiolites; the subduction zone rolled back southwards until it collided with the Niğde – Kırşehir Massif, again emplacing ophiolites during latest Cretaceous time. Vestiges of Neo-Tethyan MORB remained to the west of the Niğde – Kırşehir Massif forming the basement of the Kırıkkale and Tuz Gölü Basins. Latest Palaeocene – Middle Eocene convergence resulted in final continental collision and regional uplift including widespread unconformity formation across the Black Sea.