

## Orogenic episodes in the Pontides

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Throughout much of the Mesozoic and Tertiary the Pontides have been an active margin subject to periods of shortening and extension. Most of this deformation was accretional rather than collisional and was related to the dynamics of the northward subduction of the Tethyan oceanic lithosphere. A further complexity is that the Pontides were not a single plate but consisted of three plates or terranes (Sakarya, Istanbul and Strandja) with independent histories prior to the Early Cretaceous.

A major contractional event occurred during the latest Triassic in the Sakarya terrane and involved the accretion of Upper Paleozoic-Triassic trench sediments and oceanic crust to the southern margin of Eurasia. The accretional unit, called the Karakaya Complex, comprises eclogites and blueschists with Late Triassic isotopic ages and is tectonically imbricated with Hercynian basement units. This Cimmeride orogeny is linked to the closure of the Paleo-Tethys and the opening of the Neo-Tethys, however, the spatial and temporal relations between these two oceanic domains are not clear. The Karakaya Complex and the Hercynian basement units are unconformably overlain by the Lower Jurassic conglomerates and sandstones, marking the beginning of a new depositional cycle in the Sakarya terrane. A significant disconformity marks the contact between the Lower-Middle Jurassic clastic rocks and the Upper Jurassic marine limestones. The Late Jurassic-Early Cretaceous (Oxfordian-Barremian) is represented throughout the Sakarya Zone by carbonate deposition interpreted as the development of a southward facing passive carbonate margin. In contrast, a northward vergent contractional orogen occurred at the Jurassic-Cretaceous boundary in the Strandja terrane in the western part of the Black Sea. It involved thrusting of the Hercynian basement over the Triassic-Jurassic cover sequence and associated regional metamorphism. The metamorphic rocks of the Strandja Massif are unconformably overlain by Cenomanian shallow marine sandstones providing a firm upper age limit for the regional metamorphism. This orogenic event is probably linked to the collision between the Strandja and Rhodope terranes. No evidence for a latest Jurassic-earliest Cretaceous contraction is found in the neighboring Pontic terranes (Istanbul and Sakarya) indicating that the Strandja was part of a different plate at least up to the earliest Cretaceous.

A major accretional event occurred in the Sakarya terrane in the mid Cretaceous (Albian), probably related to the collision of a microcontinent, as shown by the eclogites and blueschists in the Central Pontides with 100 Ma metamorphic ages. These metamorphic ages also imply ongoing subduction during the upper parts of the Early Cretaceous, although arc magmatism developed only in the Turonian-Coniacian. Aptian-Albian was also the period of the amalgamation of the three Pontic and the rifting of the Western Black Sea basin. Late Cretaceous throughout the Pontides was a time of extension characterized by the deposition of a thick submarine volcanoclastic sequence. Several angular unconformities characterize the southern margin of the Pontides during the Late Cretaceous, these are probably related to the dynamics of oceanic subduction rather than to regional shortening.

The Tethyan oceanic realm south of the Pontides, in existence since the Paleozoic, finally closed in the Paleocene-Early Eocene through collision with the Anatolide-Tauride Block, followed by the thickening of the Pontide crust and northward thrust imbrication of the Pontic margin in the Early Eocene. This was followed by a poorly understood regional extension event during the Mid Eocene. Middle to Upper Eocene sedimentary and volcanic rocks and plutons cover large areas in the Pontides and also extend to the south of the Izmir-Ankara-Erzincan suture. This Mid-Eocene extensional event has been linked to the opening of the Eastern Black Sea basin. By the beginning of the Oligocene almost all of the Pontides were above sea level and stayed above sea level due to continuing shortening.

The geological history of the Pontides is dominated by their proximity to subduction zones through the Mesozoic and is characterized by accretional contractional and extensional events during the Late Triassic and Cretaceous and an arc-continent collision during the Paleocene-Early Eocene. The Pontides has been emergent since the Oligocene due to continuing north-south shortening.