Western Anatolian Record of Subduction Initiation through Collision

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The 1,700-km-long Izmir-Ankara-Erzincan suture (IAES) in Anatolia (Turkey) marks where Gondwanan and Laurasian microcontinents collided during the Cretaceous and Paleogene. The timing and dynamics of subduction and collision along the IAES are poorly constrained resulting in competitive paleogeographic scenarios requiring unique geodynamic and biogeographic reconstructions of the Mediterranean domain and broader Alpine-Zagros-Himalayan orogen. In western Anatolia, orogenic development following subduction initiation has been poorly documented. The timing of collision is debated: sometime in the Late Cretaceous to Early Eocene. Eocene slab breakoff is inferred from geochemical data but is either not supported or unresolved in mantle tomography and has not been tested using other techniques.

We use the Saricakaya and Central Sakarya Basins in western Anatolia to appraise models of subduction initiation, intercontinental collision and slab breakoff in northwest Turkey and to discuss the implications of our results for geodynamic evolution of the IAES. From measured sections, volcanic zircon geochronology, and sedimentary provenance proxies, we demonstrate that there was little topographic development associated with early subduction stages. We refine the age of intercontinental collision to the Maastrichtian-middle Paleocene. We challenge the interpretation of Eocene slab breakoff and provide a new model of syncollisional evolution in western Anatolia in which convergence, underthrusting, and accommodation space creation dominate during the early Eocene.

Finally, we compare results in western Anatolia to central Anatolia to determine that there was a synchronous magmatic history and onset of deformation along the IAES, thus supporting synchronous collision models of the IAES. The location, chronology and style of deformation and topographic development in western Anatolia is an important counterpoint to popular orogenic
cyclicity models.