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Is an inherited structure responsible for seismic activity in western Anatolia? Evolution of the İzmir-Balikesir Transfer Zone since Miocene time

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Within the Aegean extensional system, the İzmir-Balikesir Transfer Zone (İBTZ) is a recently recognized crucial element in the late Cenozoic evolution of western Anatolia since it accommodates the differential deformation between the Cycladic (CCC) and the Menderes (MCC) metamorphic core complexes. Its origin may be attributed to the influence of the basement structure inherited from the transform nature of the zone during the late Cretaceous. This is supported by faults within the İBTZ, which may have their earliest record in the late Cretaceous convergence, related to an existing transform zone perpendicular to the Neotethys. Here, we determine; (i) the vertical axis rotational history of western Anatolia using new paleomagnetic data from the Miocene volcano-sedimentary rocks, (ii) kinematic data using fault plane data from major structures of the area to better understand the active role of the İBTZ in Miocene to recent. Our paleomagnetic results reveal two discrete and opposite major rotational phases since the early Miocene. Kinematics of structures agrees with these results while three major deformational phases are identified along the İBTZ.

Combining geophysical literature with paleomagnetic and kinematic evidence of this study suggests that the İBTZ not only separated two core complexes, the MCC and the CCC, but also played an active role as a deep-seated structure related to tear along the subducted northern edge of the African slab. Hence, it is not only a surface expression of a tear in the subducting African slab, but also one of the causes of recent seismic hazards of the region. The focal mechanism solutions of recent seismic events -such as 1992 Doganbey, 2003 Seferihisar and 2005 Sigacik earthquakes- occurred along the İBTZ corroborate that it is still an active element and transfers west Anatolian extensional strain into the Aegean Sea.

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