# Shear in the west part of the North Aegean Trough in a 100+ years scale

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**Abstract**

The North Aegean Trough (NAT) is a prominent, about 1000m deep marine basin in North Aegean Sea (Greece). At its eastern part, at the continuation of the North Anatolian Fault, NAT is identified with a narrow basin which hosted, among others, the 2014, Mw6.9 Samothraki-Gokceada earthquake and at its middle, NAT is overprinted by a transtensional basin, while farther west its width increases and becomes a rather diffuse, double half-graben structure. In the past, NAT was assumed to continue through the Greek mainland, but the active tectonic pattern of this area (including evidence from Quaternary raised shorelines) and the bending of streamlines of homogeneous slip vectors from the permanent HEllenic POsitioning System (HEPOS) GPS network indicate that the mainland coast represents a kind of deformation barrier.
High quality triangulation data partly covering the west edge of NAT indicate shear consistent with morphotectonic, seismological and recent GPS data between the 1930's-1960's, but not for the interval 1890's-1920's. This result is statistically significant and apparently free of measurement, computational and modeling bias. This inferred instability in the deformation pattern derived from historical geodetic data is intriguing because short-term fluctuations in the deformation pattern are not expected in a major strike slip fault. Still, the inferred change in shear is fully consistent with changes in seismicity. The interval 1890's-1920's of no shear is marked by seismic quiescence, while the interval 1930's-1960's is characterized by moderate and strong earthquakes, and such a correlation may have a structural significance.

On these grounds and based on the morphotectonics of the west edge of the NAT, on the distribution of Quaternary/Holocene raised shorelines and on the pattern of streamlines of the GPS-derived tectonic displacements, we can propose the following scenario. The west part of the NAT represents a structurally composite area and not a simple strike slip-controlled environment, and its overall deformation reflects the cumulation of different tectonic processes at different stages, as well as the influence of adjacent tectonic provinces (boundary effects). Superimposition of the deformation rates from these effects and sources may temporarily obscure certain regional effects (e.g. shear from the east), emphasize transient effects and lead to alternation of clusters of strong earthquakes with relatively short aseismic intervals. Deformation of this area may also provide some clues for the problem of how major strike slip faults terminate.

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