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Superposition of the neotectonic events in a complex multi extensional terrain evolution during post-Miocene in western Anatolia (Gediz-Alaşehir Graben, western Turkey)

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Interplay between the dynamic effects of the northward subduction of the African plate beneath the Aegean continental fragment and the North Anatolian dextral strike slip fault to the north is causing a complex large-scale extensional crustal deformation and volcanism evolution in the Aegean extensional province. The Gediz-Alaşehir Graben (GAG), being in that large scale extensional crustal region, is a NW-SE trending extensional basin developed to the north of Bozdağ horst (K Menderes).

The faults of the GAG are multidirected high angle normal faults dominantly with NW-SE trend and with mainly dip-slip overprinted onto strike slip structural data. The NW-SE trending high angle normal faults with splays cross-cut the E-W trending low angle normal faults (detachment surfaces) along the southern boundary of the GAG, simply implying at least two extensional processes acted in the region.

The slip data were collected from both the faults controlling the Quaternary configuration –Akhisar, Çaldağ, Manisa and southern margin faults- and faults cross-cutting the Miocene sequences infilling the graben. Angelier's reverse inversion method was carried out to differentiate the different phases of deformation acting in the GAG. The result of the slip data dominantly displays a NNE-SSW to NE-SW directed extension. The NNE-SSW initial extension was rotated about 30 [U+F0B0] clockwise sense to NE-SW direction extension based on the analysis from superimposed slickenlines. On the other hand, the Miocene units manifested a compressional (strike-slip) tectonics especially along the western boundary of the GAG, possibly inherited from older strike slip structure at depth. Plus, contractional slip data are also collected for the period of post-early Miocene-pre-Pliocene. This may support the existence of a region wide short term lived contraction as earlier proposed or contractional data existed along the edges of block boundaries of rotated faults. However, the NNE-SSW to NE-SW directed extensional Plio-Quaternary slip data overprinted onto dextral strike slip NNW-SSE directed compressional data in various locations. To sum up, the extensional deformational phases are superimposing the older contractional systems.
The superimposed dextral strike slip data from the faults –from Eskişehir fault in NE to Efes fault in SW- point out a region wide counterclockwise rotation in western Anatolian province followed by extension under the control of North Anatolian shear in north and southern Aegean subduction in south. Structurally, the Quaternary configuration of the GAG is controlled by the NNE-SSW –NE-SW multidirected extensional high angle normal faults instead of the low angle normal faults.

Key words: extension, counterclockwise to clockwise rotation, Gediz, Aegean extensional province.

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