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Kinematic analysis of ductile shear zones and brittle faults in the Alacamdag region, northwestern Turkey – implications for extensional and compressional deformation in the Aegean extensional province

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Western Turkey, which forms the eastern part of the Aegean extensional province, has been broadly recognised as a region of continental extension that has been active since at least the Late Oligocene – Early Miocene. Recent research revealed that compressional regime were involved in these extensional regions as evidenced by occurrences of reverse faults and a series of folds developed within the metamorphic basement rocks, ductilely sheared granitoids and volcano-sedimentary successions of western Turkey. Although many attempts have been made for highlighting the regional kinematics of compression in the region, it is not yet clear whether compressional regime is continuous or episodic event during extensional period. We provide geological and structural data from the Alaçamdağ region that bears important information for solving this controversy. The region includes syn-extensional, low-angle ductile shear zones and the overprinting high-angle brittle faults, which have been active since Early Miocene. Low-angle ductile shear zones within the syn-extensional granites include a series of NE-trending symmetrical folds. Stretching lineations together with fold axis orientations mark NE–SW extension and NW–SE compression. High-angle brittle faults, which have normal, reverse, oblique- and strike-slip displacements, are conjugate fault sets that show strike orientations around NW–SE , NE–SW and NNW–SSE directions. They cut the Early Miocene volcano-sedimentary succession and appear to have locally controlled the Late Miocene to Pliocene continental deposits. Normal, oblique- and strike-slip faults contain two sets of overprinting striations that indicate reactivation of oblique- and strike-slip movements on the pre-existing fault planes. Kinematic analysis on the striated fault planes showed approximately NE–SW and NW–SE-directed extension and compression. It can be claimed that the NE-trending extension was accompanied by compressional forces since Early Miocene. Compressional regime may be attributed to the motion of Anatolian block from east to west due to propagation of the North Anatolian Fault.

Key words: ductile shear zones; extensional tectonics; extension-parallel folds; palaeostress analysis; north-western Anatolia