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To cite this article: N Bonev *et al* 2008 *IOP Conf. Ser.: Earth Environ. Sci.* **2** 012012

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Metamorphic and Ar/Ar geochronology constraints on the Alakeçi shear zone: Implications for the extensional exhumation history of the northern Kazdağ Massif, NW Turkey

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Abstract. The Kazdağ Massif exposes a metamorphic dome in the Biga Peninsula of northwest Turkey. An extensional origin has been proposed for the dome, limited on both flanks by detachments and/or shear zones. The northern flank is bounded by the extensional Alakeçi Shear Zone (ASZ), whose P-T-t path is still poorly known. We therefore focus on its metamorphic conditions and related temporal history to precise its tectono-metamorphic evolution. The local tectonostratigraphy in structurally ascending order comprises: (i) the high-grade metamorphic core rocks of the Kazdağ Massif (gneisses and micaschists intercalated with amphibolites and marbles); (ii) the two kilometer-thick ASZ; (iii) the overlying unmetamorphosed pre-Cenomanian accretionary Çetmi mélange; and (iv) Neogene sedimentary and volcanic cover rocks. ASZ mylonites were derived from both the core rocks and the mélange lithologies. From the north to the south the mylonitic fabrics in the ASZ depict a top-to-the N-NNE shearing, parallel to the NNE-plunging stretching lineation and NNW-dipping mylonitic foliation. This geometry implies normal sense movement i.e. north-side down-dip extensional displacement along this flank of the Kazdağ Massif. The northward transition from ductile to brittle-ductile regime through the ASZ shows that the deformation occurred at decreasing temperatures and degree of metamorphism. The paragenesis in equilibrium within the mylonitic gneisses and schists contains Qtz + Fs + Ms + Bt + Grt ± St ± Sill, with late retrogressive chlorite after biotite and garnet. Four samples of ASZ rocks yielded pressures between 6.9-5.7 kbar and temperatures between 706-587 °C. Three samples from the mylonitic rocks supplied in situ isochron ³⁶Ar/⁴⁰Ar mica ages between 31.2-24.2 Ma, which we interpret to date the cooling of the mylonites following the P-T decrease across the ASZ. The metamorphic and structural results support the extensional character of the ASZ, and sketch transition from sillimanite core gneisses in the deeper structural levels to chlorite schists towards the top of the shear zone. These new data allow to precise the peak P-T conditions and the temporal evolution in the northern flank of the Kazdağ Massif, where Late Oligocene

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extensional exhumation was assisted by NNE-directed ductile-brittle ASZ, which had operated from amphibolite to greenschist facies. At the regional scale, this tectono-metamorphic pattern is similar to those observed on other places of the north Aegean domain.