



Miocene to Quaternary tectonostratigraphic evolution of the middle section of the Burdur-Fethiye Shear Zone, south-western Turkey: Implications for the wide inter-plate shear zones

İrem Elitez ^{*}, Cenk Yaltırak

Istanbul Technical University, Faculty of Mines, Department of Geological Engineering, 34460, Maslak, Istanbul, Turkey

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ABSTRACT

The Burdur-Fethiye Shear Zone (BFSZ) is a 75- to 90- km wide and 300-km-long transtensional left-lateral shear zone which is located in one of the most tectonically active regions in south-western Turkey. A considerable number of studies suggested contradictory models of the evolution and Neogene stratigraphy of the BFSZ and in most cases, the local river and alluvial fan deposits were mapped together with the lacustrine sediments and assigned a Pliocene age. We present new field data, fault kinematic analyses, and DEM and earthquake data to characterize the tectonic controls and extent of the middle section of the BFSZ including Acipayam, Çameli and Gölhisar basins. Our field observations revealed two distinct sedimentary sequences that unconformably overlie the pre-Neogene basement. The first sequence begins with middle-upper Miocene meandering- and braided-river sediments of the Gölhisar Formation, which transition upward into lacustrine sediments of the upper Miocene-lower Pliocene İbceik Formation. This sequence is overlain by upper Pliocene-lower Quaternary alluvial fan conglomerates, mudstones and claystones of the Dirmil Formation. The basin deposits located in the middle section of the BFSZ consist of lacustrine sediments of a late Miocene lake that likely evaporated due to the Messinian salinity crisis. Fault kinematic analysis and DEM and earthquake data indicate that the middle BFSZ can be characterized as a heterogeneous left-lateral transtensional shear zone rather than a major fault system. Our findings suggest that the middle section of the BFSZ developed under the influence of progressive counter clockwise rotation of south-western Turkey, the Aegean graben system and the Cyprus and Hellenic arcs since the middle Miocene.

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1. Introduction

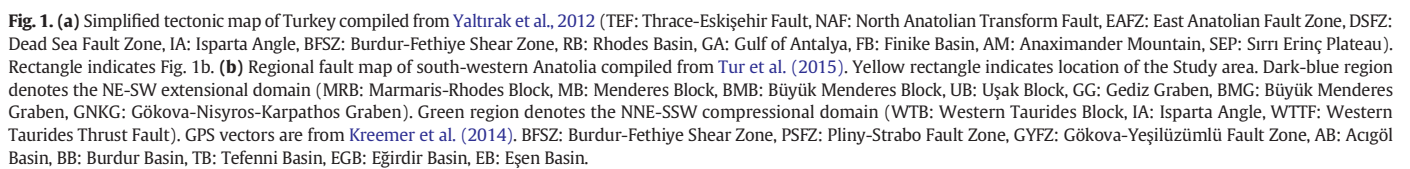
South-western Turkey is one of the most tectonically active areas in the eastern Mediterranean region (Fig. 1a). This region is dominated by westward motion of Anatolia along the North Anatolian Fault and East Anatolian Fault (Dewey and Şengör, 1979; Şengör, 1979; Şengör et al., 1985), a NE-SW Aegean back-arc extension regime due to roll-back of the Hellenic Arc (Le Pichon and Angelier, 1979; McKenzie, 1978; Meulenkamp et al., 1988; Yılmaz et al., 2000) and the subduction transform edge propagator (STEP) fault zone related to the motion of the Hellenic and Cyprus arcs (Govers and Wortel, 2005; Hall et al., 2014a). The Burdur-Fethiye Shear Zone is a tectonic structure in south-western Turkey bounded by the southern part of the Aegean extensional province on the west (dark-blue region in Fig. 1b) and the Western Taurides Block on the east (green region in Fig. 1b). This shear zone is a 75- to 90-km-wide left-lateral transtensional zone that extends approximately 300 km between Şuhut-Çay on the northeast and Sarıgerme-Gelemiş

on the southwest on land and to the Pliny-Strabo Fault Zone (Fig. 1b; Taymaz and Price, 1992; Barka and Reilinger, 1997; Woodside et al., 2000; Huguen et al., 2001; Zitter et al., 2003; ten Veen, 2004; ten Veen et al., 2008; Aksu et al., 2009; Hall et al., 2009, 2014a; Yaltırak et al., 2010; Ocağolu, 2012; Elitez and Yaltırak, 2014b; Elitez et al., 2015, 2016b). In previous studies, these NE-SW-striking left-lateral faults, which were apparently present between Burdur and Fethiye in south-western Turkey, were named the Burdur Fault, Fethiye-Burdur Fault, Fethiye-Burdur Fault Zone, Burdur-Fethiye Fault Zone or Burdur-Fethiye Shear Zone (e.g. Barka et al., 1995; Eyidoğan and Barka, 1996; Barka and Reilinger, 1997; Glover and Robertson, 1998; ten Veen, 2004; Verhaert et al., 2004, 2006; Alçiçek et al., 2006; Bozcu et al., 2007; ten Veen et al., 2008; Över et al., 2010, 2013; Elitez and Yaltırak, 2014b; Hall et al., 2014a,b; Elitez et al., 2015).

The Burdur-Fethiye Shear Zone is characterized primarily by left-lateral offset with a normal component (Dumont et al., 1979; Şaroğlu et al., 1992; Taymaz and Price, 1992; Price and Scott, 1994). Barka et al. (1995) stated that this zone is a major boundary fault separating western Anatolia from the Isparta Angle. Eyidoğan and Barka (1996) suggested that the western flank of the Isparta Angle is made up of the

^{*} Corresponding author.

E-mail address: elitez@itu.edu.tr (I. Elitez).



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