

Neogene–Quaternary evolution of the Tefenni basin on the Fethiye–Burdur fault zone, SW Anatolia–Turkey



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ARTICLE INFO

Article history:

Received 28 November 2015

Received in revised form

29 February 2016

Accepted 29 February 2016

Available online 2 March 2016

Keywords:

Fethiye–Burdur fault zone

Tefenni basin

Neogene–Quaternary

Kinematic analysis

Western Anatolia

ABSTRACT

The Fethiye–Burdur fault zone (FBFZ) is a complex belt of major break in the southwestern Anatolia. A number of basins occur within the FBFZ. The Tefenni basin is one of the NE–SW trending basins located in the central part of the FBFZ. The basin is 10–20 km wide and 60 km long. It contains two infills of fluvial, lacustrine and alluvial fan deposits from late Miocene to Recent. The older and folded infill rests on the pre-middle Miocene basement rocks with an angular unconformity and consists of fluvial and lacustrine sediments. The younger and undeformed Plio–Quaternary basin fill unconformably overlies the older basin fill and is composed predominantly of conglomerate, mudstone, silt, clay and recent basin floor sediments. The Tefenni basin is controlled by a series of NE–SW trending left lateral oblique-slip normal faults along its margins. The Tefenni and Mürseller faults bound the northwestern margin of the basin and the Kemer fault bounds the southeastern margin of the basin. The basin is also cut by NE–SW striking major and NW–SE, N–S and E–W striking small scale normal faults. Structural analyses in the basin show that NE–SW-trending contraction stress regime ended by Pliocene and was followed by NE–SW-trending extension from Pliocene onward.

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1. Introduction

The Fethiye–Burdur Fault Zone is a major structure in the southwestern Anatolia (Fig. 1). It forms the easternmost boundary of the west Anatolian extensional province (Dumont et al., 1979; Barka and Reilinger, 1997). The fault zone comprises a group of subparallel branching and en-echelon, northeast-southwest trending, oblique faults with left lateral strike-slip component and normal faults. It lies within a nearly linear belt, as much as 40 km in width, extending from the Gulf of Fethiye in the eastern Mediterranean northeastward through the western limb of the Isparta Angle, a distance of about 310 km (Dumont et al., 1979; Taymaz and Price, 1992; Price and Scott, 1994; Barka and Reilinger, 1997; Yağmurlu, 2000; Elitez and Yaltrak, 2014; Hall et al., 2014). The Fethiye–Burdur fault zone is the most seismically active fault zone in southwestern Anatolia and the kinematics and earthquake history indicate that it is a major seismic hazard for the region (McKenzie, 1978; Eyidoğan et al., 1991; Barka et al., 1995; Koçyiğit, 2000; Bozcu et al., 2007).

One of the important features of the Fethiye–Burdur fault zone is its effect on the formation of the regional morphology. Displacement along the fault zone has had a big impact on the topography of the region and generated topographic highs and depressions along the fault zone. The fault zone embraces several northeast trending, elongated basins aligned parallel or subparallel to the fault zone such as the Eşen, Çameli, Gölhisar, Tefenni, and Burdur basins. Although many geological studies have been carried out in some of these basins (e.g., Eşen basin, Temiz et al., 2001; ten Veen, 2004; Alçiçek, 2007; Yerli et al., 2008; Çameli–Gölhisar basins, Alçiçek, 2001; Alçiçek et al., 2004, 2005, 2006; ten Veen et al., 2009; Över et al., 2010; Elitez and Yaltrak, 2014; Tefenni basin, Varol, 2011; Varol and Davraz, 2014; Burdur basin, Karaman, 1986, 1994; Price, 1989; Şenel, 2002; Bozcu et al., 2007; Alçiçek et al., 2013; Över et al., 2013), neotectonic features of the Tefenni basin have not been studied.

The Tefenni basin is one of the principal basins developed in the central part of the fault zone (Fig. 1). This basin is a 60 km long and 10–20 km wide, NE–SW trending depression (Fig. 2). We carried out detailed geological mapping at a scale of 1:25,000 in order to understand the structural features of the Tefenni basin. This paper describes the structural framework and kinematics of the Tefenni segment of the Fethiye–Burdur fault zone and its role in the

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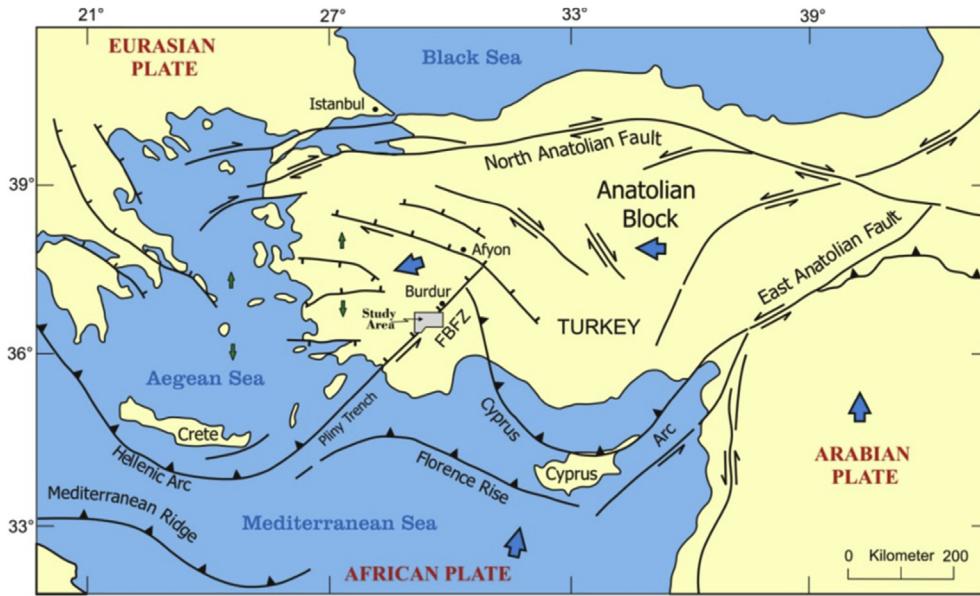


Fig. 1. A simplified map showing the Fethiye-Burdur fault zone (FBFZ) in the neotectonic framework of Turkey and surrounding areas (modified from Barka et al., 1995; Reilinger et al., 2010).

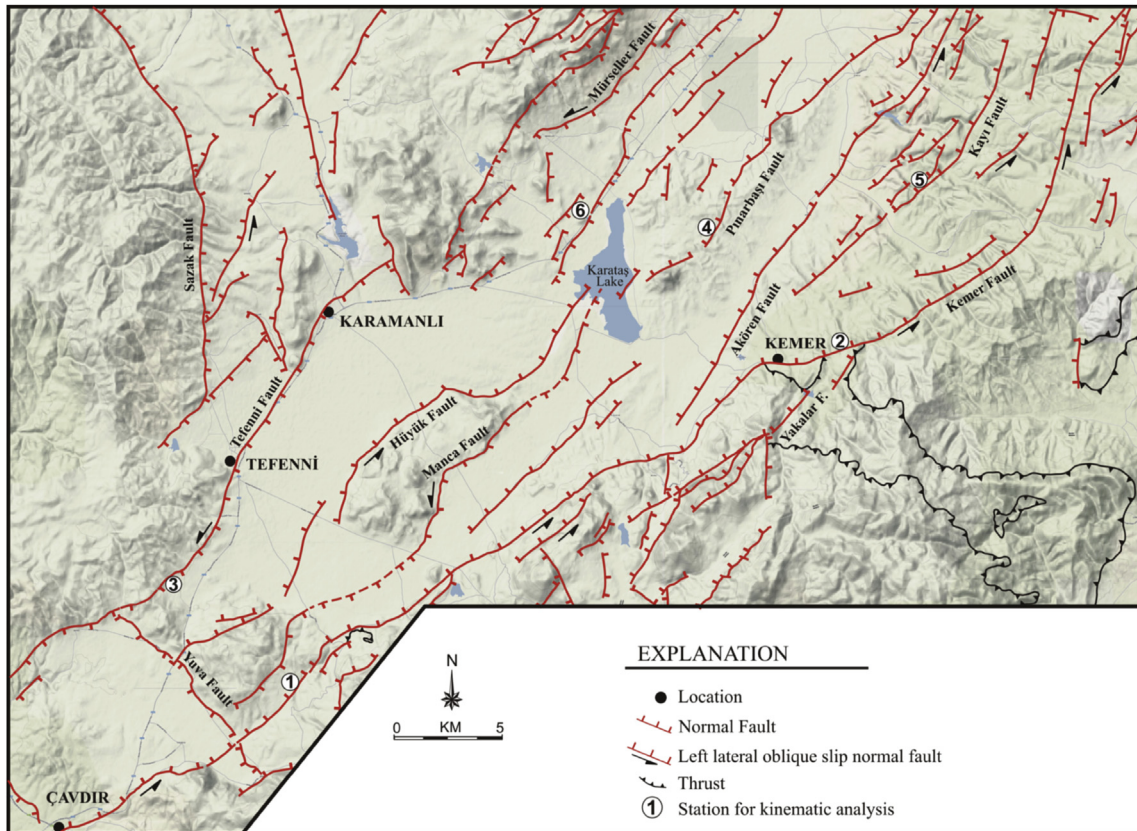


Fig. 2. Digital elevation map (DEM) of the Tefenni basin and major fault traces. Numbers refer to locations of fault-slip data presented in Tables 1 and 2, and Figs. 8 and 9.

development of the basin.

2. Physiography of the area

Fig. 2 represents the topographic form of the Tefenni basin

created by the faulting. The Tefenni basin is 10–20 km wide and 60 km long. It trends NE-SW and contains infills of middle-upper Miocene-Quaternary fluviolacustrine sediments and Holocene alluvium. The Fethiye-Burdur fault zone in the Tefenni area is characterized by steep fault-controlled ridges juxtaposed against large

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