



Tectono-stratigraphy of the Neogene basins in Western Turkey: Implications for tectonic evolution of the Aegean Extended Region

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ABSTRACT

The western part of the Aegean region includes several Neogene basins containing volcano-sedimentary successions. The Neogene basins, located along the northern Menderes Extensional Metamorphic Complex (MEMC) were developed during the Miocene as supra-detachment basins. They contain two distinct volcano-sedimentary successions, separated by a regional unconformity. The basins located to the west of the MEMC were developed as strike-slip basins and contain volcanic and sedimentary units getting younger from NE to SW with no remarkable unconformity.

Available paleomagnetic studies in the Aegean Region suggest to us that, the basins to the west of the MEMC were developed in response to southward clockwise rotational roll-back of the Aegean subduction zone. The eastern margin of this rotational deformation is characterized on the surface by a large strike-slip zone, which is known as İzmir–Balıkesir Transfer Zone (İBTZ). The sedimentary successions in the basins along the northern MEMC do not show southward younging and are interpreted to be developed in response to exhumation of the MEMC. During the Pliocene to Quaternary, ~E–W-trending grabens such as the Gediz (Alaşehir), Büyük and Küçük Menderes Grabens were developed in response to tectonic escape accompanying the slab-roll back process. These grabens truncate the MEMC basins. During this time, strike-slip deformation and associated sedimentation continued along the İBTZ.

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1. Introduction

The Aegean Extensional Province has a long and complex geological history (Fig. 1). It has experienced several compressional and extensional deformational phases which have been summarized in many papers (e.g., Çemen et al., 2006; Jolivet et al., 2013; Okay and Tüysüz, 1999; Rimmelé et al., 2003; Ring et al., 2010; Şengör and Yılmaz, 1981; van Hinsbergen et al., 2005, 2010a). All researchers agree that the province has experienced a Cenozoic extensional tectonics which is still effective. However, the timing of initiation of the Cenozoic extension has been controversial. Many researchers proposed that the Cenozoic extensional tectonics in the western Anatolian part of the region was initiated in the Middle (e.g., Yılmaz et al., 2000) or earliest Miocene (e.g., Seyitoğlu et al., 1992). Several recent studies, however, proposed that the extension has begun in Late Oligocene in western Anatolia (e.g., Catlos and Çemen, 2005; Çemen et al., 2006; Lips et al., 2001), or in Early Eocene in the Rhodope region (cf., Jolivet and Brun, 2010).

The cause of the Cenozoic extension has also been controversial. The proposed mechanisms of extension include a) post-collisional extension, generated in response to crustal thickening after the collision between the Tauride–Anatolide Platform and the Sakarya Continent (e.g., Seyitoğlu et al., 1992); b) westward escape or lateral extrusion of the Anatolian plate along the North Anatolian and the East Anatolian Fault Zones (Çemen et al., 1999; Şengör and Yılmaz, 1981; Şengör et al., 1985), due to the Eurasian and Arabian plate collision along the Zagros suture zone; c) subduction roll-back and associated back-arc extension (Jolivet and Brun, 2010; Jolivet et al., 2013; Le Pichon and Angelier, 1981; Meulenkamp et al., 1988, 1994; Spakman et al., 1988) and d) a three-stage continuous simple shear extensional model as a result of the mechanisms listed above (Çemen et al., 2006; Gessner et al., 2013).

One of the key areas in the Aegean Extensional Province is the western Anatolia (Figs. 1 and 2) which contains the Menderes Extensional Metamorphic Complex (MEMC) (Bozkurt and Park, 1994; Çemen et al., 2006; Emre, 1996; Işık and Tekeli, 2001; Lips et al., 2001), one of the largest metamorphic core complexes in the world. The MEMC has begun to develop during the Late Oligocene–Early Miocene extensional deformation (e.g., Bozkurt and Park, 1994; Çemen

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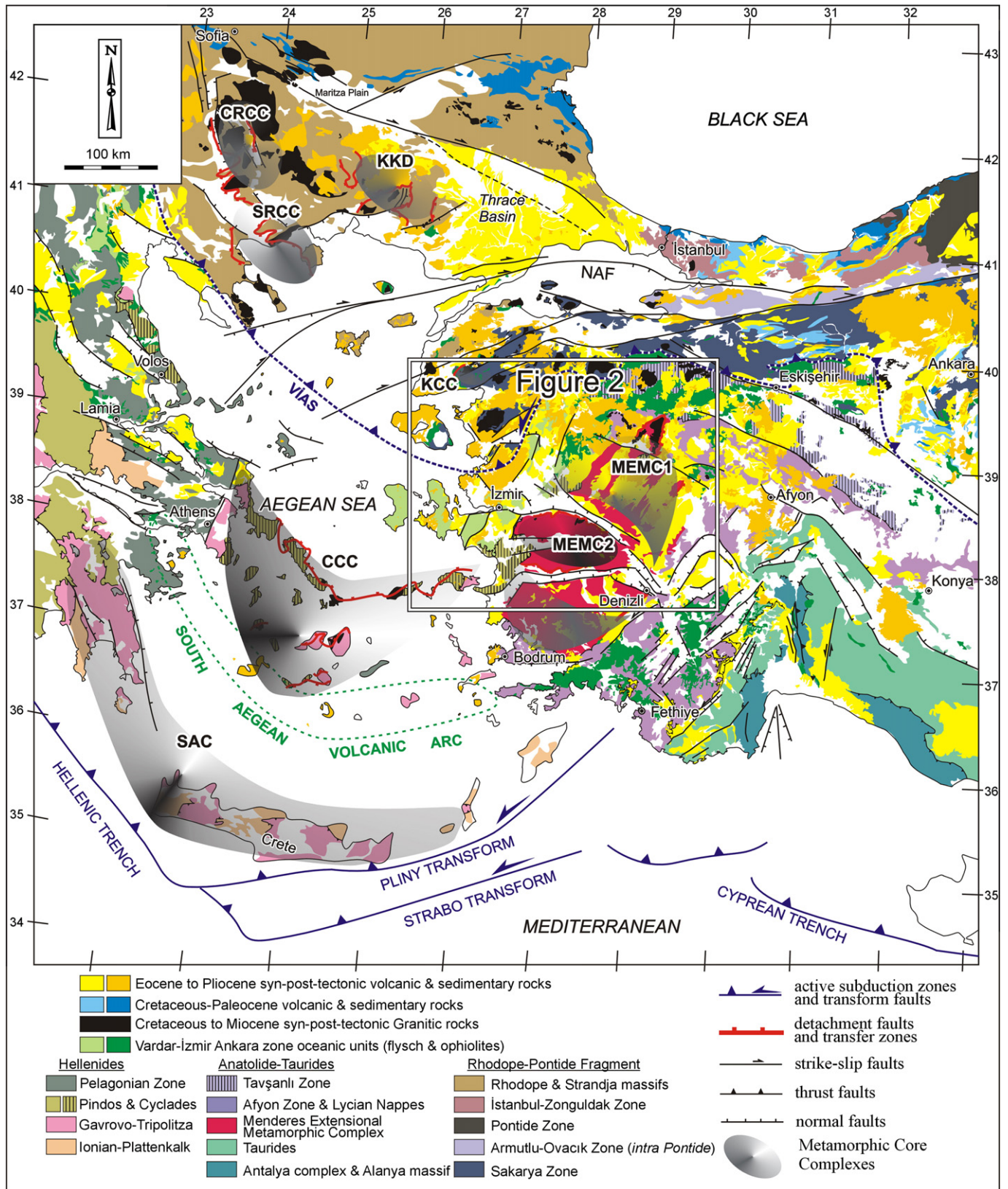


Fig. 1. Tectonostratigraphic units and major tectonic elements of the Aegean Extensional Province (compiled from 1/500,000 scaled geological maps of Greece (IGME) and Turkey (MTA), Okay and Tüysüz, 1999; Ring et al., 2001, 2010; Candan et al., 2005; van Hinsbergen et al., 2005; Ersoy and Palmer, 2013). CRCC: Central Rhodope, SRCC: Southern Rhodope, KCC: Kazdağ, CCC: Cycladic, SAC: South Aegean (Crete) core complexes. KKD: Kesibir-Kardamos Dome. MEMC1 and MEMC2 refer to first- and second-stage development of the Menderes Extensional Metamorphic Complex (MEMC). VIAS: Vardar-Izmir-Ankara suture zone, NAF: North Anatolian Fault Zone.

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