We test the relationships between oroclinal bending-related vertical axis rotations in southwestern Turkey, and their relationship with exhumation of the central Menderes core complex (CMCC). We collected 1827 independently oriented samples from 240 sites, largely demagnetized by alternating fields with a subset treated thermally. To the southeast of the Lycian Nappes and Bey Dagları regions rotated ∼20° between 16 and 5 Ma, defining the eastern limb of the Aegean orocline. These Miocene sediments were not remagnetized as suggested earlier, and carry a primary NRM as indicated by paleomagnetic field tests and by a novel rock magnetic test involving end-member modeling of acquisition curves of the isothermal remanent magnetization. The region north of the CMCC shows a minor clockwise rotation. The total rotation difference (∼25°) agrees very well with the angle between detachments bounding the CMCC enabling the recognition of the rotational pivot-point. Pre-rotational extension in the late Oligocene to early Miocene in the eastern part of the Aegean back arc was NE–SW oriented and likely bounded by a discrete transform. Oroclinal bending in the west Anatolian region is interpreted to be related to a reconnection of the eastern part of the Aegean orocline with the African northward moving plate, in tandem with roll back in the Aegean back arc. This is similar to a recently postulated scenario for western Greece.