

Tectonics of the Aegean/Anatolian region
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ABSTRACT: The Anatolian/Aegean includes much of Greece and Turkey. The region is noted for its seismic activity. Much of the eastern Anatolian region is moving westward relative to Eurasia while the southern Aegean Sea is moving southwest. The northern boundary of the region experiences dextral strike-slip motion, while the southeastern boundary shows evidence of sinistral strike-slip motion. The southwestern boundary is a subduction zone. Other areas are more complicated and display a variety of plate interactions, including an area in western Turkey marked by east-west trending normal faults due to north-west extension. Recently acquired GPS data compare well with geophysical, seismic, computer model-generated and other geodetic data. Integrating all these creates a picture of the regional tectonic activity that raises the possibility that the entire region may be best viewed as a single plate with a central zone of weakness that is presently being torn into two separate plates by a combination of external tectonic forces.

INTRODUCTION

The Anatolia region, an area comprising most of Turkey, the Aegean Sea and Southern Greece, is noted for its active tectonics. Tectonic evidence suggests that, relative to Eurasia, most of Turkey is moving westward and most of the Aegean Sea and Southern Greece is moving southwest. The reasons for these movements are open to interpretation. Currently, two different views of the regional tectonics are common: 1) the entire region is part of a single microplate rotating about an Euler pole located on or near the Arabian peninsula; or 2) the area is actually 2 separate microplates—the Anatolian, moving west relative to Europe, and the Aegean, which is moving southwest. This paper will examine some of the tectonic evidence that has led researchers to the differing interpretations.

BOUNDARIES

The Anatolian/Aegean region is currently sandwiched in between the African, Arabian and Eurasian plates. The northern boundary is marked by the North Anatolian Fault (NAF) in the east and the Northern Aegean Trench (NAT) in the west. The NAF has a long history of seismicity, and is characterized by dextral strike-slip motion (Papazachos 1999), as the Anatolian plate moves westward relative to the Eurasian plate. The NAT show similar strike-slip movement, but with a slight southward dip. The NW corner of the region is very tectonically complex and defined by subduction zones on either side of the Cephalonia (also spelt “Kefallonia”) Transform Fault (Sachpazi et al. 2000)—another area of dextral strike-slip motion caused by the interaction of the Aegean and Adriatic microplates (Papazachos et al. 2000), but in a more southerly direction relative to Eurasia (Papazachos, 1999, referencing Scordilis 1985).

The southwest boundary of the region is dominated by the Hellenic Arc—a zone of subduction where the African plate moves under the Aegean Sea (Papazachos 1999). The Hellenic Arc contains the Hellenic trench, the Hellenides mountain chain and an inner volcanic arc (Giunchi 1996). The Hellenic subduction zone terminates at the Florence Rise, a submarine ridge (Scott 1981) that marks the beginning of the Cyprus Arc, an area of apparent subduction in the past but which has since ceased (Zitter et al. 2000). This area between the Hellenic Arc and the Cyprus Arc and has been characterized as “enigmatic” by Zitter et al. It shows transpressional deformation and strike-slip faulting. As the Cyprus Arc continues on inland it leads into the East Anatolian Fault, an area of sinistral strike-slip motion that eventually terminates at the NAF.

PLATE MOTIONS

Jackson (1994) describes two dominant plate motions in the Aegean/Anatolian region: the westward motion of the Anatolian plate and the southwestern motion of the Aegean plate, both relative to Eurasia (see figure 1). The Anatolian plate is moving

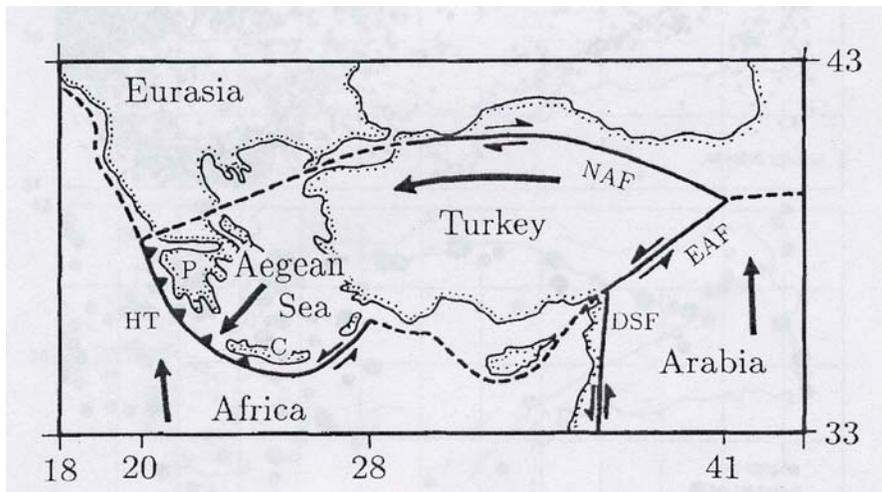


Figure 1: Plate motion in the Aegean/Anatolian region (Jackson 1994).

westward, relative to the Eurasia, in eastern Turkey at approximately 40 mm/yr (Le Pichon et al. 1995), but begins moving southwesterly in the western part of the country (Jackson 1994). Le Pichon et al. have described the movement of the Anatolian/Aegean region as a rigid rotation around an Euler pole located north of the Nile delta, but point out several inconsistencies in this model (see figure 2).

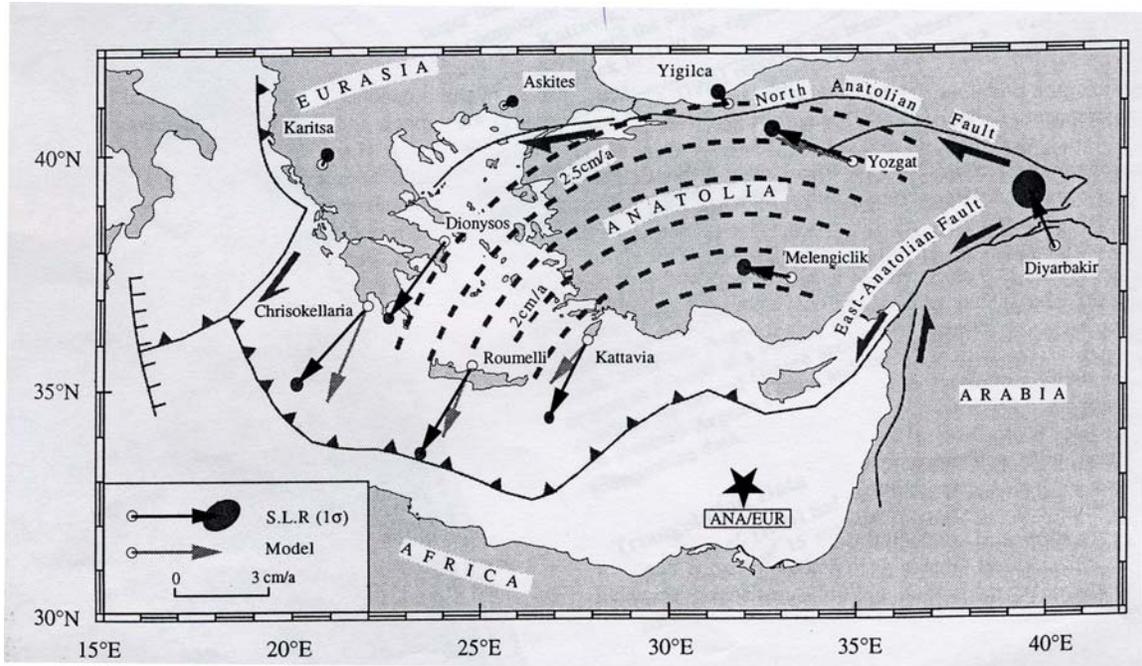


Figure 2: A single Anatolian plate model. An Euler pole located just north of Africa is represented by the star. Notice the discrepancies in the Aegean Sea between the predicted plate motion (light gray arrows) and the motions detected by satellite ranging laser (SLR) (black arrows) (Le Pichon 1995).

The central Aegean region is expanding to the Southwest, possibly because of the motion of the Anatolian plate (Doutsos and Kokkalas 2001). This southwest motion terminates at the subduction of the African Plate, which is moving slowly northward relative to the Eurasian Plate (Jackson 1994), along the Hellenic trench.

Overall plate interactions appear to be as follows: the Arabian Plate is moving northward relative to the Eurasian Plate, creating the strike-slip motion along the EAF (Jackson 1994; McClusky et al. 2000). A current view is that the motion of the Arabian plate is transferred to the Anatolian Plate (Le Pichon et al. 1995; Cianetti et al. 2001;

Doutsos and Kokkalas 2001). Doutsos and Kokkalas (2001) however, describe a second “arc-normal pull” on the Anatolian plate from the west, as forces from subduction at the Hellenic trench are transferred via the Aegean plate to the western Anatolian plate.

Whether the entire region is moving as a single plate (see, for example Oral 1995; Doutsos and Kokkalas 2001), with an Euler pole located slightly north of the Sinai Peninsula (Cianetti et al. 2001), or as two separate plates (see Scott 1981; Jackson 1994; Papazachos 1999) is currently an area of speculation. Scott (1981) treats the area as two separate microplates, with the boundary between the two plates under the Mediterranean Sea, hence, its elusiveness. Others, including Papazachos (1999) view an area of north-south extension in western Turkey as the “transition zone” between the two plates.

GEOPHYSICAL OBSERVATIONS

The region has apparently experienced collisional shortening since the late Mesozoic and Tertiary (Jackson 1994) possibly due to the westward motion of the plate into an immobile Ionic margin along continental Greece (Cianetti et al. 2001). This shortening has resulted in a series of folds, thrust faults and sutures in mainland Greece, across the Aegean and into western Turkey (Scott 1981; Jackson 1994) More recently, the trend has been toward extensional and strike-slip deformation (Jackson 1994), especially toward the west and along the borders.

Areas of western Turkey show evidence of north-south extension (Jackson 1994; McClusky et al. 2000). Morewood and Roberts (2001) describe this region as one of the “fastest extending regions of Earth’s crust.” South of western Turkey the Anaximander Mountains appear to have been rifted from the Taurus Mountains in southwestern Turkey (Zitter et al. 2000). Seafloor mapping of the eastern Mediterranean using multibeam

bathymetry and backscatter imaging reveal this as an area experiencing dextral motion, containing titled blocks and fold belts—evidence of northeasterly compression corresponding to an approximately 6% shortening. There is evidence of previous subduction in this area, but any subduction has stopped (Zitter et al. 2000).

The southwest boundary is marked by the Hellenic Island Arc, an area characterized by seismicity, gravity anomalies, an oceanic trench and a volcanic arc inside the trench (Scott 1981), which supports the interpretation of this area as a subduction zone.

The western border of Turkey is part of a small region—approximately 700 km x 700 km according to Jackson (1994)—of deformation. Papazachos et al. (2000) define this “belt” of deformation as the eastern boundary of the Aegean plate (Eastern Aegean Boundary, or EAB). Focal mechanisms of this area show north/south extension (Jackson 1994) with fault planes running approximately east to west (see figure 3).

The Eastern Anatolian fault zone also shows evidence of strong earthquakes in the past (Jackson 1994, referencing Ambraseys 1989). Although earthquake activity has declined somewhat this century, the few moderate-sized earthquakes in the area this century suggest left-lateral strike-slip motion (Jackson 1994), which supports the interpretation of the northward movement of the Arabian Plate, relative to Eurasia, being accommodated by westward movement of Anatolia (Doutsos and Kokkalas 2001).

Although surrounded by zones of seismicity on three sides (see figure.4), central Turkey is relatively flat and aseismic (McKenzie 1972, according to Jackson 1994). This makes determination of the southern plate margin difficult. Scott (1981) points out that there is no well defined seismic zone in the area. Despite the presence of the Cyprus Arc,

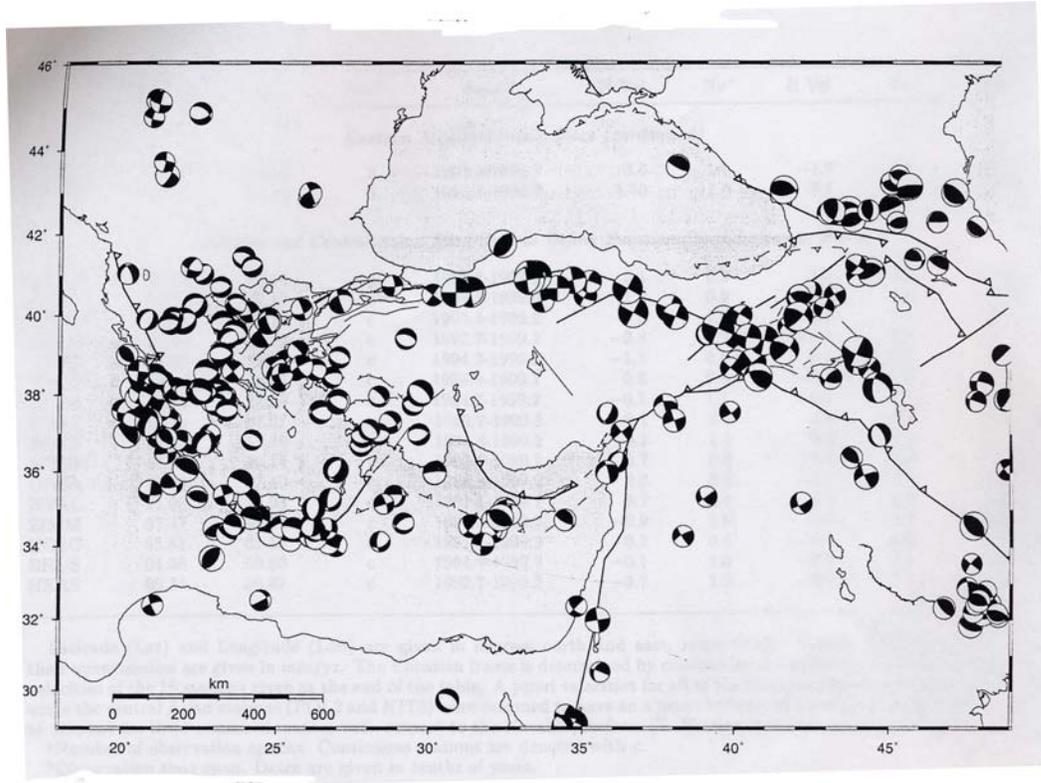


Figure 3: Focal mechanisms for the Aegean/Anatolian region (McClusky et al. , 2000).

there is no evidence of inner arc andesitic volcanism. Yet this area exhibits an ophiolitic complex. The region extending from Adana-Iskenderun to Antalya—essentially the eastern two thirds of Turkey’s coastline—forms a “sedimentary arc,” with ophiolites found beneath Tertiary and later sediments (Scott 1981).

West of Turkey, however, seismicity increases significantly and creates a ring around a relatively aseismic area in the southern Aegean Sea (see fig. 5). The bulk of this “ring” is the Hellenic subduction arc and trench in the south. The Hellenic subduction arc is a result of the convergence of the Aegean and African plates at the rate of approximately 2.5 cm/yr (Giunchi et al. 1996). This convergence plays a major role in the deformation of the area (Cianetti et al. 2001). One way this is manifested at the surface is as an arc of volcanoes north of the South Aegean Trench.

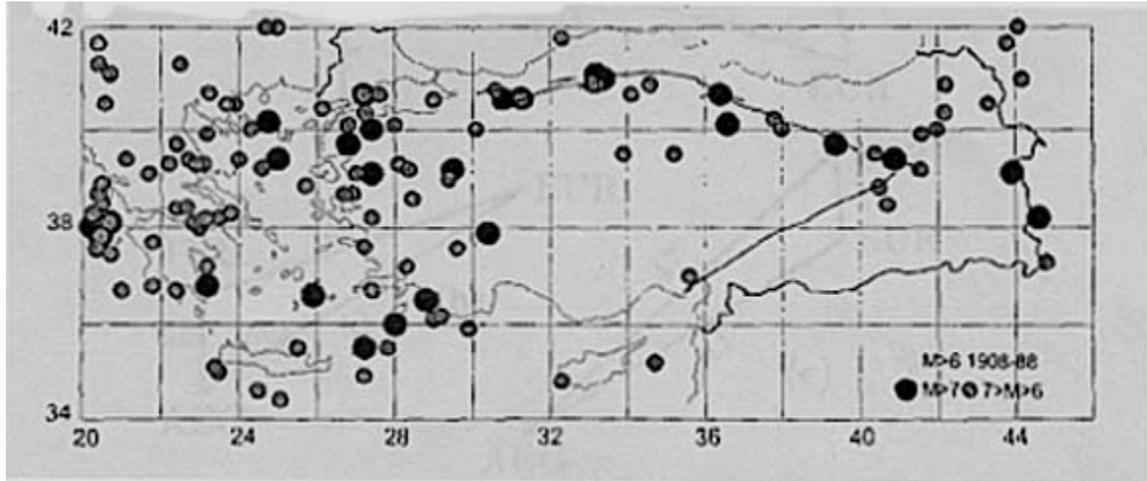


Figure 4: Magnitude 6 or greater earthquakes for the period 1963-1988. Note the lack of seismicity in central and southern Turkey (Jackson 1994).

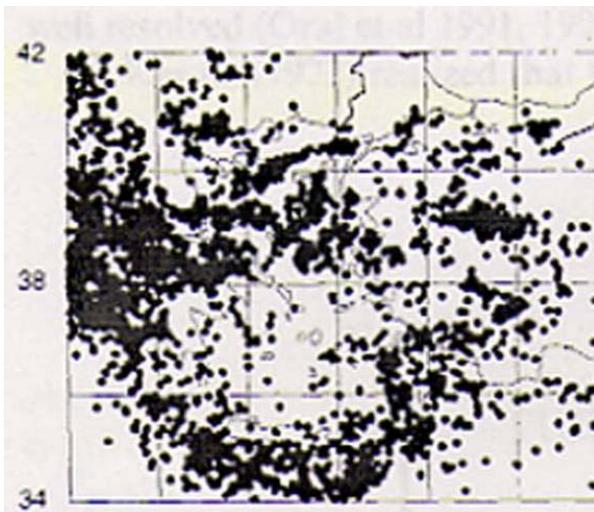


Figure 5: Zone of seismicity forming "ring" around the southern Aegean Sea. Black dots indicate all earthquakes shallower than 50 km between 1963 and 1988. (Jackson 1994).

Papazachos et al. (2000) have determined that the foci of shallow earthquakes along the fore-arc of the Hellenic arc are confined to the upper 20 km of the Aegean crust. According to the authors, a Wadati-Benioff zone defines the boundaries of the subducting slab. They identified this zone by analyzing the difference in P and PcP wave arrival times, which allowed them to determine the location of intermediate-depth

earthquakes. This Wadati-Benioff zone offers the strongest evidence of subduction. The authors report that the Wadati-Benioff zone starts at 20 km under the outer part of the arc and dips towards the back-arc, where it eventually reaches a depth of 150 km.

In assessing the Hellenic Arc, Papazachos et al. (2000) relied on 3 sets of data: 1) earthquakes recorded at local seismic stations from 1986 to 1995, 2) earthquakes of depths greater than 100 km recorded by the International Seismic Center, and 3) all regional earthquakes of magnitude > 5.5 since 1956 with reliable fault plane solutions. To analyze the data, the authors divided the region into 3 distinct zones: the western, the central, and the eastern zones. In the western zone, the shallow zone has a depth of about 20 km in the fore-arc and back-arc areas. The Wadati-Benioff zone starts at the convex side of the trench and grows deeper moving in from the trench. Earthquake locations suggest that the Wadati-Benioff zone begins to dip at an angle of around 30° at 20 km and continues at this angle until it reaches around 100 km. The dip angle changes to around 45° at 100 km and continues down to 180 km, where seismicity terminates. The central zone is similar, except from the presence of intermediate ($h > 100$ km) earthquake epicenters beneath or close to the Hellenic trench south of Peloponnese. The eastern zone has shallow seismicity limited to 20 km. The Wadati-Benioff zone does not show dipping between 20 km and 100 km from the fore-arc to the back-arc area in this zone. Furthermore, in this zone there is a seismic gap between 80 km and 100 km. (This will be discussed further in a later section.)

MODELING DATA

Giunchi et al. (1996) modeled the tectonics of Crete, an area corresponding to the central zone of Papazachos et al. (2000) study, with the finite element code MARC. They

report on two different models. The intention was to model two major processes—subduction under the Hellenic Arc, and the convergence of the African and Aegean plates. One model relied on solely gravitational instability, driven by subduction, while the second model also included the effects of convergence by adding a velocity of 1 cm/yr to the left margin. In contrast to Papazachos, Giunchi et al. , using earthquake data from Comninakis and Papazachos (1980) and Kiratzi and Papazachos (1995), deduced shallower subduction angles: $\sim 14^\circ$ down to 70 km, and then getting steeper to 30° below 70 km. Note, however, that they also included a change in dip angle at an intermediate depth.

Both of the models developed by Giunchi et al. predicted the areas of uplift and subsidence seen in the region, including the trench, the uplift of Crete, the subsidence of the Cretan trough, and the uplift of the volcanic arc. They attribute these alternating regions of uplift and subsidence to the flexural response of the plate to the gravitational instability of the oceanic lithosphere and the active plate convergence. The trench subsidence is attributed to the descent of the lithosphere, and the uplift and subsidence to the bending and overthrust of the Aegean plate. Of the two models, the model including the convergence velocities appears to show greater uplift of Crete—approximately 5 mm/yr—which the authors claim compares favorably with results from other studies, citing Lambeck (1995) as an example.

In matching the results of their models with known focal mechanisms for the area, Giunchi et al. note that the model including convergence velocities shows reverse faults in the shallow (<20 km) zone just in front of the trench, while the gravitational only model does not. Since these reverse faults are known to exist, they conclude that an

active, 2.5 cm/yr plate convergence is consistent with high uplift rates in Crete and that both slab pull and active convergence is required to account for the deformation in the region.

Cianetti et al. (2001) used a program called Laramy to create a thin plate thermomechanical finite element (FE) model of the region. Using a procedure that they credit to Bird (1989), they attempted to account for the large-scale deformations of the Anatolian/Aegean region by the forces acting at the boundaries. They relied on two driving mechanisms: the push of the Arabian plate and the pull of the subduction, which they called the Trench Suction Force (TSF), at the Hellenic Arc.

Cianetti et al. generated many different models, all using the same boundary conditions but with different combinations of three major influences: TSF from the Hellenides subduction zone, contact with a fixed Adriatic plate (in northern Greece) and plate homogeneity vs. lateral heterogeneity. They then compared their models with published geodetic and geophysical data sets, including data from Kahle et al. (1995), and Le Pichon (1995), and GPS velocities from McClusky et al. (2000).

Although they were able to show that the Anatolian/Aegean plate moves west, relative to Eurasia, in response to the northward relative motion of the Arabian plate, they were not able to account for the deformation of western Anatolia using a simple plate rotation model. Rather, they discovered that the best fit with published velocity data came from the model incorporating all three major influences. They conclude that there are three forces influencing the motion of the region: the westward push from the Arabian plate, the TSF from the subduction of the African plate, and the collision with the Apulia landmass of a fixed Adriatic plate. Furthermore, their model closely mirrors GPS

velocities when they treat the region as a single plate with lateral heterogeneity, but they are unable to achieve as close a match with a homogeneous model.

Cianetti et al. conclude that the heterogeneous tri-force model shows the highest extension in western Anatolia, which they reference to the findings of Lundgren et al. (1998). It also shows the north-south extension in this area reported by McClusky et al. (2000). They conclude that this extension occurs because the high strength of the Aegean lithosphere transfers the Hellenic TSF to Anatolia.

SEISMIC DATA

The Mediterranean Sea has been referred to as a transition zone between the African and Eurasian plates, with the eastern region as the most tectonically active part. In this region, the Aegean Sea area has been the most tectonically “conspicuous” this century (Kahle et al. 1999).

The entire Anatolian/Aegean region is very seismically active. In northern Turkey the NAF is almost entirely defined by a series of strike-slip earthquakes. Figure 4 shows a line of earthquakes that define the NAF from its junction with the EAF to its western termination. Focal mechanisms (see figure 3) show predominant strike-slip faulting with most slip vectors aligned approximately east to west. At its western termination, however, the line of earthquakes become more diffuse, and the NAF splinters into a series of parallel strike-slip faults oriented SW to NE (Jackson, 1994).

As Papazachos et al. (2000) examine earthquake data for the entire Hellenic Arc, they come to conclusions similar to those of Giunchi et al. (1996). In the shallow crust they note the presence of normal faulting, which they attribute to the expansion of the Aegean Sea, and some strike slip faulting at the Cephalonia Fault, in the inner part of the

arc. The outer part of the Arc, the Hellenic Trench, experiences thrust faults due to the convergence of the Aegean and Eastern Mediterranean lithospheres. The descending slab reveals strike-slip faulting with elements of thrust faulting, with maximum tension parallel to the dip, and maximum compression horizontal and parallel with the Arc.

In the shallow zone, stress axes change from thrusting, with horizontal compression and vertical tension, in the fore-arc to normal, (horizontal tension, vertical compression) in the back arc in the shallow zone. This supports the results of the Giunchi, et al. (1996) model. Compression axes remain constant down to 50 km and even lower in the eastern zone. Below 50 km, the extension axes follow the dip direction of the subducting slab.

Papazachos et al. (2000) conclude that the restriction of shallow (<20 km) earthquakes results from the properties of the crust, and the earthquakes below 20 km indicate the dipping of the subducted lithosphere. The authors define the Wadati-Benioff zone as starting about 20 km at the outer arc and dipping down toward 150 km under the volcanic arc. The zone appears to have two “branches”, a shallow branch with a dip of 30° from 20km down to 100 km, and a deeper branch from 100 km to 180 km that dips at 45°. The subducting slab shows a discontinuity in the eastern zone between 75 km and 95 km, possibly attributable to slab tearing. In terms of stress axes, the strong shallow earthquakes, between 20 km and 55 km, show horizontal compression and thrust faulting, and deeper earthquakes, between 55 km and 100 km, display tension parallel to the Wadati-Benioff dip, indicative of strike-slip faulting with elements of thrust. These results also support the Giunchi et al. (1996), model.

Papazachos et al. (2000) attribute shallow seismicity, between 20 km and 100 km, to coupling between the Aegean and Mediterranean lithospheres. They explain the discontinuity in the eastern zone by positing that the Aegean plate, due to its southwestern motion, has passed the subducted slab of the African oceanic crust and is now experiencing continent-continent convergence with the African plate. They further propose that the 100 km to 180 km portion of the Wadati-Benioff zone represents the free sinking of oceanic crust, especially in the east, under the volcanic arc.

GPS DATA

Kahle et al. (1999) have used Global Positional System (GPS) data to determine a strain rate field for the Aegean/Anatolian region. They then compared this data with seismic data to present a tectonic portrait of the area. The authors first summarize the 1998 GPS data from McClusky et al. (2000), and those of Straub et al. (1997) and then present a velocity profile of the region. Central Anatolia at 30° E shows a westerly motion, relative to Eurasia, of between 20 mm/yr and 24 mm/yr. This motion changes direction to WSW at 29° E. Thrace and the northern Aegean Sea appear almost stationary relative to Eurasia, but velocities increase southward from 18 mm/yr at Limnos to 25 mm/yr at Skiros. Kahle et al. also state that the GPS stations in the southern Aegean Sea appear to move “together,” as a single block, between 28 mm/yr and 33 mm/yr SW relative to Eurasia.

Kahle et al. present a strain rate field for the entire Anatolian/Aegean area. The NAF shows compression trending NE-SW and NW-SE extension. This is consistent with the seismic data of Papazachos (1999) showing dextral shear and strike-slip motion between the Aegean/Anatolian and Eurasian plates. This stress is also apparent in the

NAT. Kahle et al. point out that the GPS strain rates along the NAF-NAT are similar in magnitude to those of the San Andreas fault, and suggests that they pose a similar seismic threat.

Although central Anatolia is relatively strain-free, western Anatolia displays pronounced north-south extension, which results in normal faulting. The area is dominated by normal strain, showing the extension that is often associated with the graben features of the area (Kahle et al. 1999), although the Marmara Sea area shows both extension and compression.

The principal stress axes revealed by the GPS data strain rates in the northern Aegean Sea (Kahle et al. 1999) are consistent with published seismic data (Jackson et al. 1994, as reported by Kahle et al.). There is a “distinct Seismic cluster” in the southeastern Aegean that the GPS data shows as an area of extension. Focal mechanisms reveal thrust faulting with distinct strike-slip elements (Kahle et al. 1999, referencing Taymaz et al. 1991).

West of this is an area of low seismicity centered around the Cycladides Islands. GPS data shows this area to be strain-free, with a velocity of 33 mm/yr. (Kahle et al. 1999). This result is in agreement with the conclusions of Le Pichon et al. (1995) and the tri-force heterogeneous model of Cianetti et al. (2001). Along the Hellenic Arc the GPS compressional axes are perpendicular to the arc, which is what would be expected in a subduction zone (Papazachos et al. 2000). Kahle et al. (1999) conclude that GPS data is consistent with seismic data throughout the region.

McClusky et al. (2000) analyzed GPS measurements of crustal motion recorded at 189 sites from 1988 to 1997 and they concluded that the velocities are consistent with

published seismic data. Their data show that much of Turkey south of the NAF moves as a single unit and experiences little internal deformation. Velocities in central Anatolia show less than 2 mm/yr internal deformation. Western Turkey, however, shows strong evidence of north-south extension, which supports the conclusions of Jackson (1994) about this area.

The GPS data reported by McClusky et al. also reaffirm the SW motion, relative to Eurasia, of the Aegean region. The authors report velocities of around 30 mm/yr in this region, consistent with most published seismic data (e.g., see Papazachos 1999). Like central Anatolia, the area south of 39°N shows little internal deformation. McClusky et al. note that the southwest motion of the southern Aegean Sea is accommodated by E-W normal faults in western Turkey, as evidenced by a series of horsts and grabens. Putting all this information together, McClusky et al. conclude that the Anatolia and Aegean regions display separate plate-like motion, with the two plates separated by a zone of N-S extension.

INTERPRETATION

Despite the good correlation of geophysical, seismic, computer-generated modeling and GPS data, many questions about the tectonics of the region remain. Seismic and velocity measurements suggest that the Anatolian and Aegean regions represent two separate microplates, yet computer models can accurately replicate plate movement velocities using a single plate motion. The region of north-south extension in western Turkey can be interpreted as a transition zone between two separate plates or as a deformation region in a single plate.

Some aspects of the regional tectonics are agreed upon. The NAT and NAF are both areas of notable dextral strike-slip motion, and the EAF experiences sinistral strike-slip motion. The westward movement of the Anatolian region and the southwestward movement of the Aegean region, both relative to Eurasia, have been supported by many studies, and the case for a subduction zone along the Hellenic Arc is also generally accepted. The main area currently under contention appears to be the nature of the deformation region of western Turkey.

Assimilating all the tectonic evidence presented in this paper could lead one to the conclusion that the Anatolian/Aegean region is neither two completely separate plates nor one intact rigid plate. Rather, it is possible that the region is one plate currently in the process of broken up into two.

Papazachos et al. (2000) present a compelling case that the change in subduction angle of the African plate under the Aegean Sea marks a transition from oceanic to continental crust on the African plate. They further suggest that in the eastern zone of the subduction region the oceanic plate has already separated, creating a discontinuity between 75 km and 95 km.

Scott (1981) presents evidence of past subduction under the Cyprus Arc, including the presence of ophiolites and Tertiary sediments along the southern coast of Turkey. Such geological formations would be expected in an area where subduction has ceased because of continent-continent collision. Furthermore, the “enigmatic” Florence Rise could be interpreted as the result of tearing of the subducted African plate due to the continent-continent collision east of the Rise and the continuing oceanic plate subduction to the west (Scott 1981).

Doutsos and Kokkalas (2001) describe an “arc-normal” pull on the western Anatolian plate due to the subduction at the Hellenic trench. This pull, called the TSF by Cianetti et al. (2001), is important in creating an accurate model of the regional tectonics. Both Giunchi et al. (1996) and Cianetti et al. require this force to generate their most accurate models. If the entire Anatolian/Aegean region were a subduction zone at one time then this TSF would have been evenly distributed across the entire southern boundary. However, when the subduction ceased in the east, then the exertion of the force would have been restricted to the Aegean and western Anatolian area. The time when the eastern continent-continent collision began and, subsequently, the unimpeded south-to-southwestern movement of the entire Anatolian/Aegean plate ended could mark the beginning of the north-south extension in western Turkey. What may have been unrestricted southwestern movement, relative to Eurasia, in response to the combination of African plate subduction and northern Arabian plate motion became restricted to western movement by the collision. Continued southern or southwestern TSF may have eventually led to normal faulting in the less rigid western section of the Anatolian plate.

There are many different ways of investigating this possibility. First, magnetic polar wandering paths could be used to interpolate relative plate motion velocities backwards to determine the time of the beginning of the north-south extension in the deformation zone. This time could then be compared to the time of the cessation of sedimentation along the Cyprus Arc. A correlation of ages would support the possibility of the two phenomena being related. Also, evidence of terrains or suturing in the deformation zone would suggest that this is an area of weakness likely susceptible to faulting from the build-up of TSF stresses. Finally, evidence of change in the past rate of

extension in this area might also support this interpretation, depending on the particular sequence of events. The TSF transferred to the Anatolian plate have been higher while the Aegean plate was subducting oceanic lithosphere. If the subducted slab was still oceanic after the continental collision in the east then the initial extension rates would have been greater, slowing down later as the African continental plate margin began moving under the Aegean plate. If the collision occurred after the western subducted slab changed to continental crust then one would expect a consistently slow extension that reflects a change in relative orientation after the collision. Determining the time of the continent-continent collision in the east and comparing it to the time of the transition from oceanic to continental crust subduction in the west would help to generate an expectation of past extension velocities that could be used for comparison with measured rates.

CONCLUSION

This paper examined geophysical, seismic, model-generated and GPS data about the tectonics of the Anatolian/Aegean region. Assembling this data into an overall tectonic portrait has illuminated the possibility that the Anatolian and Aegean plates were at one time a single plate that is currently in the process of being torn into two separate plates by a combination of forces, including the lateral push from the northward moving Arabian plate, relative to Eurasia, the southward push of an immobile Adriatic plate, and the southwestern tug of the subduction of the African plate by the Aegean plate. Suggestions for investigating this possibility are offered.

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