Kinematics studies of the Aegean plate have, as a result, presented several proposed models. McKenzie (1970) introduced the "rigid blocks" model, consisted of three micro-plates, South Aegean, NW Aegean and Anatolia. A different model, consisted by two blocks, eastern and western was proposed by Taymaz et al. (1991). Further more, Le Pichon et al. (1995) proposed the one rigid block model (S. Aegean - W. Anatolia), rotating counter-clockwise.
Papazachos et al. (1998) presented a more detailed, geotectonic configuration of the regional Aegean area. This is shown in the following figure (8.3.2).

The main features of this map are the collision fronts of the moving plates, while very important are the values of the velocities which are observed for their movement.

The African plate moves, as it is stated in the map, with a velocity of 10mm/y towards north.

The Anatolian plate moves with a velocity of 25mm/y towards west.

The Aegean plate moves with a velocity of 45mm/y towards southwest.

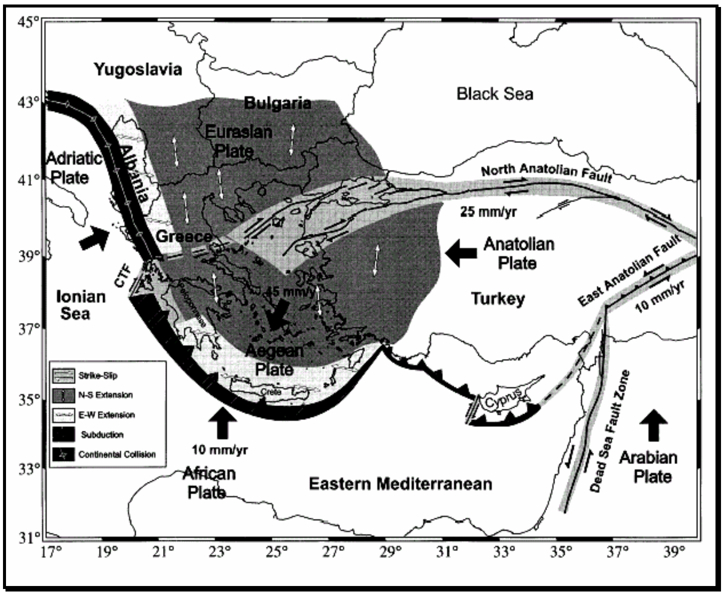

Fig. 8.3.2. Plate tectonic configuration is shown of the area around the Aegean (Papazachos et al. 1998).

As a result of the previously presented, tectonic - kinematics status of the Aegean region and the forces acting upon it, it is justified to consider the generation of a rotational moment in it and, therefore, the mechanical rotational moment - thrust model is applicable in the Aegean area. The validity of this model depends on, whether it provides with justification the different geological - tectonic - geophysical and seismological observations made for the Aegean region to date.

For this purpose, the postulated, theoretical model, which is presented in the following part of this study, will be compared with the various results, which exist from different studies that refer to the Aegean region.

8.4. Morphological data.

The morphology of an area depends on the tectonic processes which the same area was undergone in the geological past. Orogenesis, faulting, fracturing, compression, extension of the geological units taking place in an area, result in its final morphology. In the reverse order, to some extent, the morphological features of an area are capable of revealing the tectonic processes and generating mechanisms that had tectonically controlled the specific area in the geological past.

Consequently, the topographic and bathymetric relief of the Aegean region provides with the basic elements for its initial, tectonic approach. This map is presented in the following figure (8.4.1).

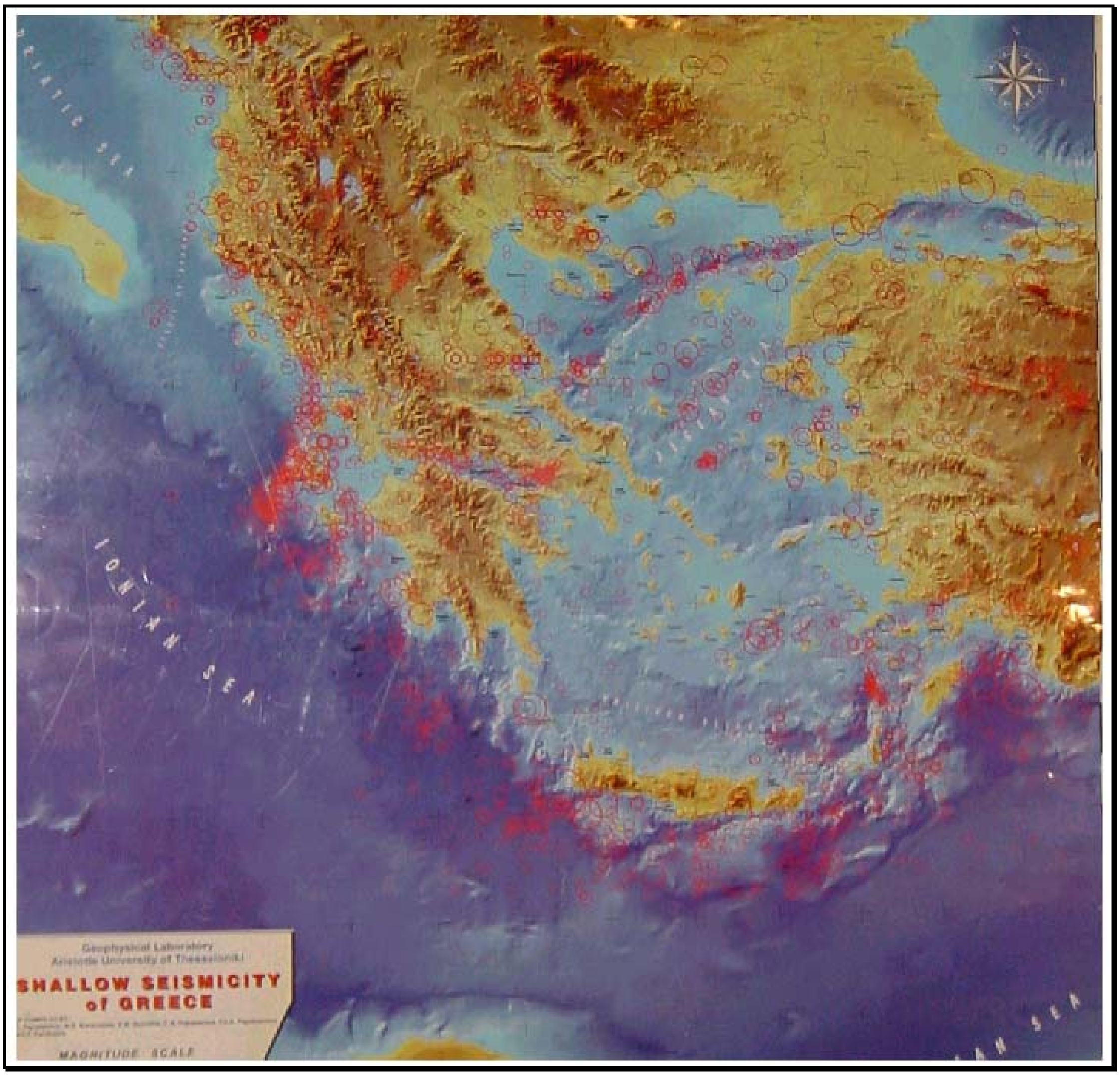

Fig. 8.4.1. Bathymetric and shallow seismicity map of the regional area of Greece (AUTH, 1985) is presented.

An overall, large-scale inspection of this map reveals the presence of a largely extended circular feature. Part of it, located at the north Aegean region, conforms to the North Anatolian Fault, while another part of it, at the southern Aegean region, conforms to the trench which is located south of Peloponnese, Crete and Rhodes. In between these two segments, there is a gap, extending from North Evoia - Biotia and Central Peloponnese, where this circular feature is just visible, due to rough change in the topographic relief.

In the Western part of Turkey, this circular feature is directed towards northwest and diminishes in the Aegean Sea. This circular feature merges with the linearly extending, Ionian trench, close to the northwest part of Peloponnese. The circular and the linear morphological features of the Aegean area are highlighted with a thick dashed red line, so that its identification is made easy. The latter is presented in figure (8.4.2). Directional filtering or pattern recognition techniques can reveal the same tectonic pattern.

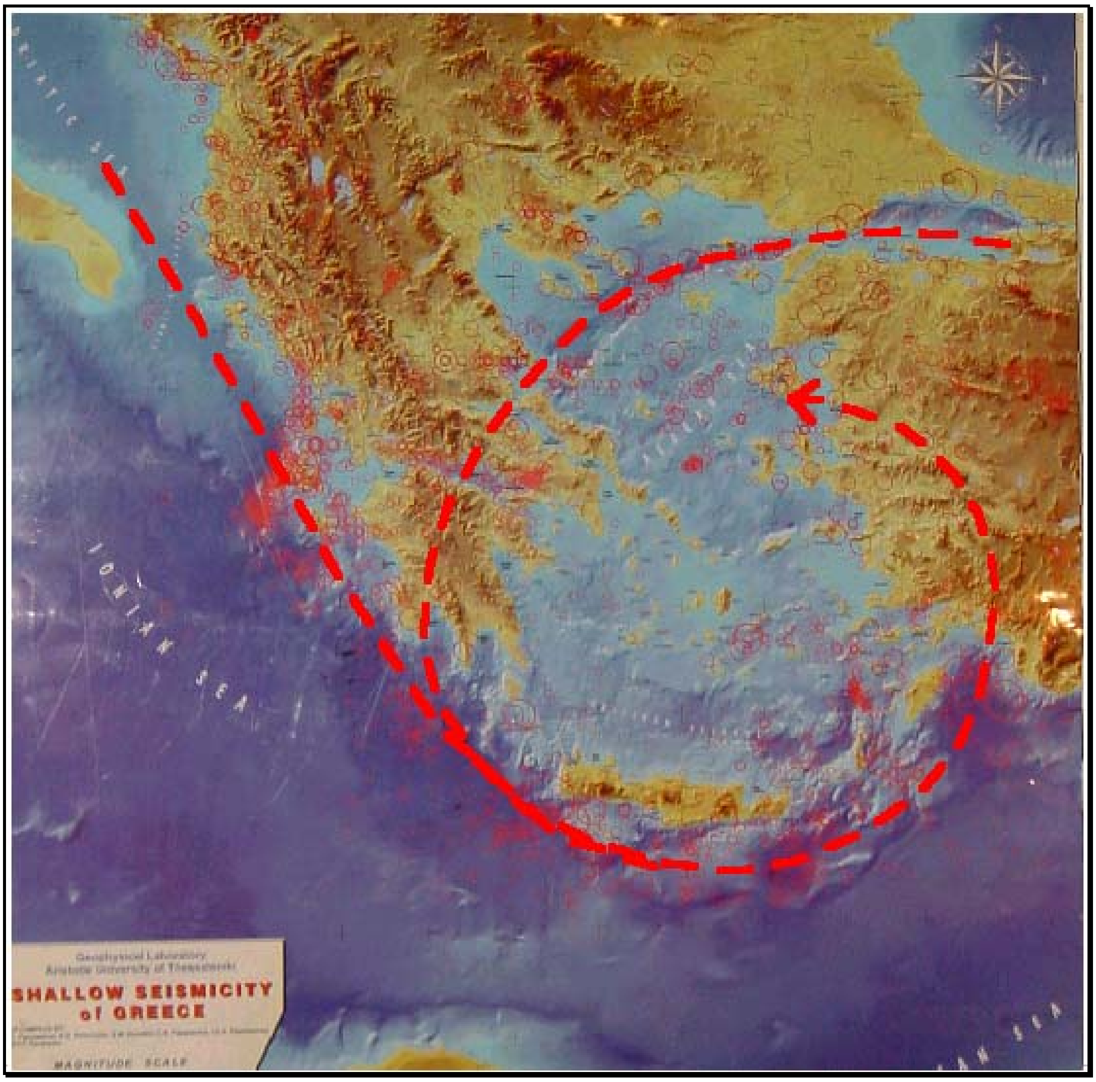

Fig. 8.4.2. Main tectonic circular and linear features, observed (tectonic axis, red dashed line), in the regional area of Greece.

The circular character of the Central Aegean region is revealed at a first approximation. This area is separated from the Adriatic plate, the Anatolian plate and the Eurasian plate with boundaries, indicated, by the thick, dashed, red line. The fact that the Anatolian plate moves westwards, while the African plate, in respect to the Aegean plate, generates strike slip faults (Bohnhoff et al. 2001) in the southeast part of it, is a first indication for the generation of a wider counter clockwise rotational moment which is applied on the Aegean plate.

8.5. Volcanic data.

Large scale and intense tectonic events that affect the lithosphere facilitate the magma to rise up to the surface and consequently lava manifestations of volcanic origin are generated. The motion of the lithospheric plates, generally, shifts gradually the initial location of the lava flow location. The well known motion of the back arc volcanic arcs is in association to this mechanism.

In the case of the Aegean plate, the lava manifestations have been mapped and dated. These are presented in color code in the following figure (8.5.1). Although, at a first glance, its spatial distribution looks rather not connected to the tectonics of the Aegean plate, if we take into account its dating and combine it to the counter clockwise rotational moment which was suggested earlier, then the following relation outcomes.

The lava manifestations conform in their generation time, from most recent (0-11my) to the older ones (16-26 my) with the central Aegean plate, with the exception of the oldest ones, which are located, northern from the North Anatolian Fault. This is presented in the following figure (8.5.2).

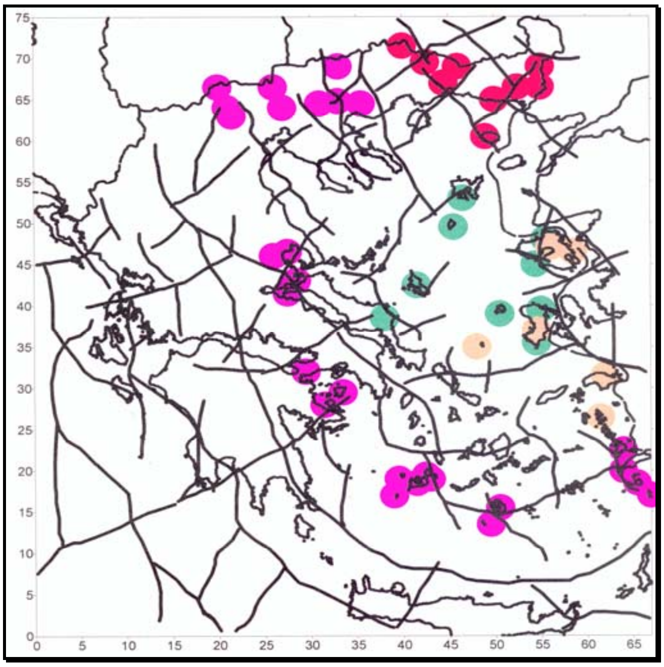

Fig. 8.5.1. Volcanic manifestations are presented, in Greece (Tacticos, 1999, Thanassoulas et al. 1999), in relation to the deep, lithospheric fractures (Thanassoulas, 1998). The color code is as follows: Purple = 0-11my (Quaternary - Pliocene), Brown = 11-16 my (Upper Miocene), Green = 16-26 my (Middle - Lower Miocene), Red = 26-36my (Oligocene).

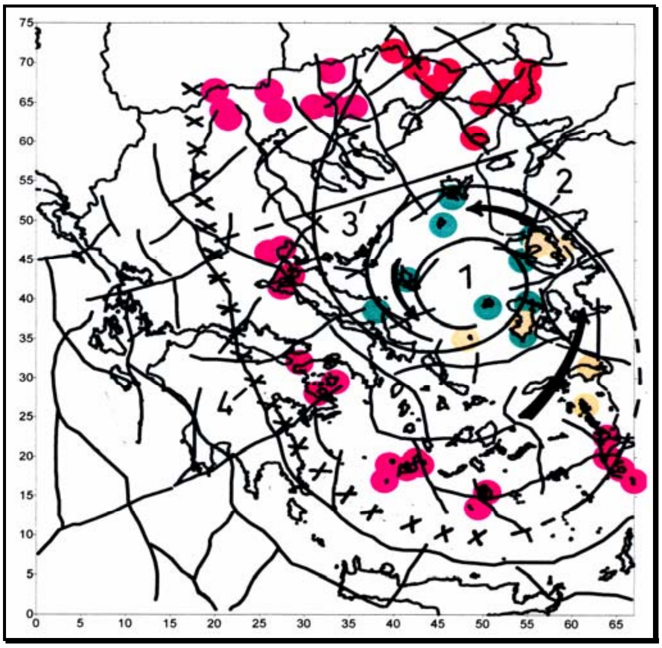

Fig. 8.5.2. Time evolution of the volcanic activity is presented, during the past 36 my. 1 = probable center of the lithospheric vortex, 2 = estimated vortex boundaries, 3 = North Anatolian Fault, 4 = probable outer vortex boundaries (Thanassoulas et al. 1999).

Assuming a CCW rotation of the southern Aegean plate and the corresponding original lavas manifestations, which were originated westwards initially, the latter have traveled along (black arrow) a path of almost 500Km. By taking into account an average velocity of 2.5cm/y for the motion of the southern Aegean plate, it results in 20my, in time needed for this travel length. This time span complies well with the dating of the lava manifestations which are observed in the Aegean plate.

Generally, the Aegean plate behaves as a lithospheric vortex (Thanassoulas et al. 1999), following a CCW rotation that modifies the location of the lava flows which were generated some million years ago, elsewhere.

8.6. Geophysical paleomagnetic data.

Paleomagnetism is a very effective and powerful tool (Irving, 1964; Beck, 1980; Van der Voo, 1993) in studying geodynamic models and particularly in its documentation. Paleomagnetic studies in Greece are dated back to 60s and they were performed by Bobier (1968) on Pliocene volcanics. This was followed by more intense research, on the same topic, by Pucher et al. (1974), Papamarinopoulos, (1978), Kondopoulou, (1982), Laj et al. (1982).

A review paper for the paleomagnetic results which are obtained in Greece to date was presented by Kondopoulou (2000). Results of Cenozoic age indicate different rotating character along the Hellenic arc (Kissel and Laj, 1988). Clockwise (CW) rotation was found in the west, counterclockwise (CCW) in the east and no rotation in the south. These results comply with other data, obtained, by Horner (1983), Horner and Freeman (1983), Lovlie et al. (1989), Marton et al. (1990). Independent rotation of blocks, fault bounded, was reported by Mauritsch et al. (1995) for the external zones of Albanides.

Clockwise rotation (CW) was identified for the Ionian Islands by Duermeijer and Langereis (1999). For Crete, Duermeijer et al (1998) reported counterclockwise (CCW) for the most of the studied sections of the Tortonian and Messinian (9.7 - 6.7 Ma). Similar rotations (CCW) were reported by Duermeijer and Langereis (1999) east of Crete, in Plio-Pleistocene sediments on the islands of Rhodes, Karpathos, and Kassos.

Walcott and White (1998) suggested an East Aegean block with prevailing counterclockwise (CCW) rotations. In Eastern Aegean - Western Anatolia strong CW rotation (Karaburun) and strong CCW (Izmir) are observed (Kissel et al. (1986a). Furthermore, data from Chios Island indicated a CCW rotation since the Middle - Miocene (Kondopoulou et al. 1993a, b). CW rotations were observed along an E-W transverse from the Mesohellenic Trough to the Greek Rhodope (Kondopoulou and Westphal, 1986; Kissel and Laj, 1988; Westphal et al. 1991; Kondopoulou, 1994). Atzemoglou (1994) suggested CW rotation for the area extending, from the Strymon valley to west Xanthi in the East and from Kavala to Greek-Bulgarian borders.

CCW rotations were reported further to the east in the Pontides, along the North Anatolia Fault and Biga peninsula (Saribudak, 1989; Platzman et al. 1994). For the eastern side of the Aegean, Sonder and England (1989) and Taymaz et al. (1991) proposed CCW rotations, while Westaway (1990a, b) suggested that most of the domains in W.Turkey rotate in CCW mode. Jolivet (1993) proposed a rotation pole in the eastern part of the Aegean and extension in this area proceeds through a CCW rotation about this pole. Le Pichon et al. (1995), using geodetic data from Greece suggested a CCW rotation that agrees with paleomagnetic results, obtained, in Chios and Izmit (Kondopoulou et al. 1993a, b)

In Argolis area, paleomagnetic data from Jurassic carbonates indicated CW rotation (Morris, 1995). In Central Greece, data, obtained, on Triassic formations (sub-Pelagonian lavas) indicated a CW rotation in Tertiary while a CCW rotation was determined before. CCW rotation was also found by Pucher et al. (1974). Sequences of Mid-late Triassic were studied in the Pelagonian (Morris, 1995) and resulted in a CW rotation. In studying Rhyolites of Upper Carboniferous to Lower Triassic in the Serbomacedonian massif (Turnell, 1988) a CCW older rotation was followed by a CW younger one.

Kondopoulou (2000), summarizing all the mentioned, afore, rotational results concluded that the CCW rotation prevails in the internal Hellenides, while CW rotations are applicable for the external Hellenides.

This concluded paleomagnetic model, in practice, complies with the rotating, mechanical model, presented in fig. **(8.2.a.4)**. The internal Hellenides correspond to the **CCW** (d) rotating plate, while the external Hellenides correspond to the **CW** rotating blocks (c), located, in the transition zone (b). The pair of **CCW** rotation of the internal Hellenides and the **CW** rotation external Hellenides must exist, so that mechanical, rotational compatibility is maintained through out the Aegean area.

The fact that **CW** and **CCW** rotations are found in discomforming places is attributed to the very local rotations of independent, small blocks, which were created by the local, lithospheric fracturing.

8.7. Geophysical gravity data.

8.7.1. Gravity deduced fracture zones.

Forces, applied, on a solid material, may produce fracturing in it and consequently, motion of the produced blocks. In a larger scale, i.e. the Aegean plate, forces, acting upon it, produce different tectonic results, as generation of faults, orogenesis, rotation of the different blocks, generation of shields, relocation of geological formations, just to mention some of them. As a result of this mechanism, the gravity field of the Earth is modified accordingly and therefore, it is possible, by inversely modeling of the gravity field, to study the tectonics, stratigraphy and generally the mass distribution in 3D form in the under study area.

The methodology of converting the gravity field into deep, lithospheric, fracture zones was firstly introduced by Thanassoulas (1998). Major faulting produces large gravity field horizontal gradients, which are observable into the corresponding gravity maps. The procedure is straightforward and consists of transforming the original Bouguer anomaly map, through a transformational operator, into a horizontal gradient map. Peak axes of gradient values denote the existence of lithospheric, fracture zones. The latter is presented in the following figure (8.7.1.1). The used operator required a 10x10 Km grid of original data and its length was 20Km. Therefore only deep fracture zones are detected, of large wavelength, which, mostly, are not visible on the ground surface by the geologists and therefore, have not been mapped, yet.

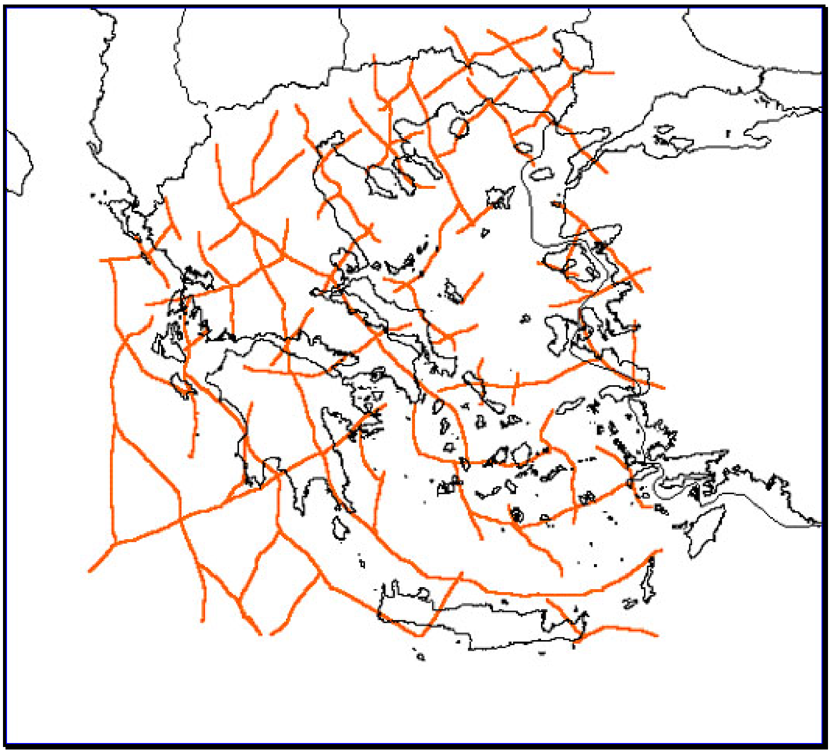

Fig. 8.7.1.1. Deep, lithospheric, fracture zones, mapped, by the analysis of the gravity field, in Greece (Thanassoulas, 1998)

The inspection of the map in figure **(8.7.1.1)** reveals two groups of deep fracturing. The first one shows a circular character, while the second one shows a radial one.

8.7.1.1 Circular fracture zones.

This group of fracturing **(fig. 8.7.1.1.1)** is highlighted by the use of thick, black, dashed lines. It is remarkable, the way the concentric circles comply with almost all the fracturing of this mode. The approximate center of the circles is located in the central Aegean region, while part of the circles expands over western Turkey.

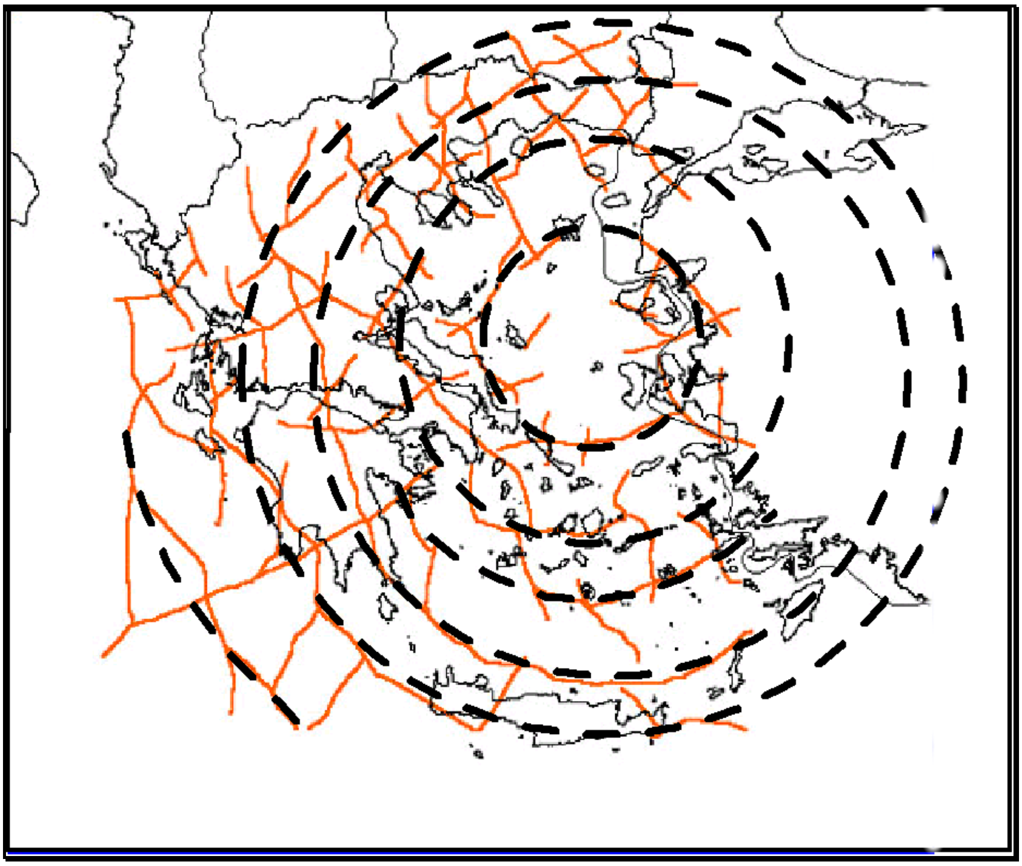

Fig. 8.7.1.1.1. Circular mode of the deep, lithosperic, fracture zones in Greece.

The last trace of a circular, fracture zone is detected in the SW area of the Ionian Sea, while at the western part of Turkey fractures are missing, due to lack of gravity data in this region.

The question, that comes up immediately, is how these circular, fracture zones were generated. This is answered by the postulated, rotational, mechanical model for the Aegean plate (fig. 8.2.a.4). **As long as the central part of the Aegean plate rotates, in a CCW mode, then fracturing occurs, tangentially, along circles of rotation and therefore, main fracturing of the lithosphere will occur along the circumferences of these circles**. The main cause of the circular, fracturing is the differential velocity of adjacent, fracturing areas, due to velocity change from zero (external stable area a) to a certain value, applicable to the inner, rotating plate (d) of the Aegean region.

8.7.1.2 Radial fracture zones.

The second fracturing group presents a radial mode and is highlighted by solid thick black lines. This is presented in the following figure **(8.7.1.2.1)**.

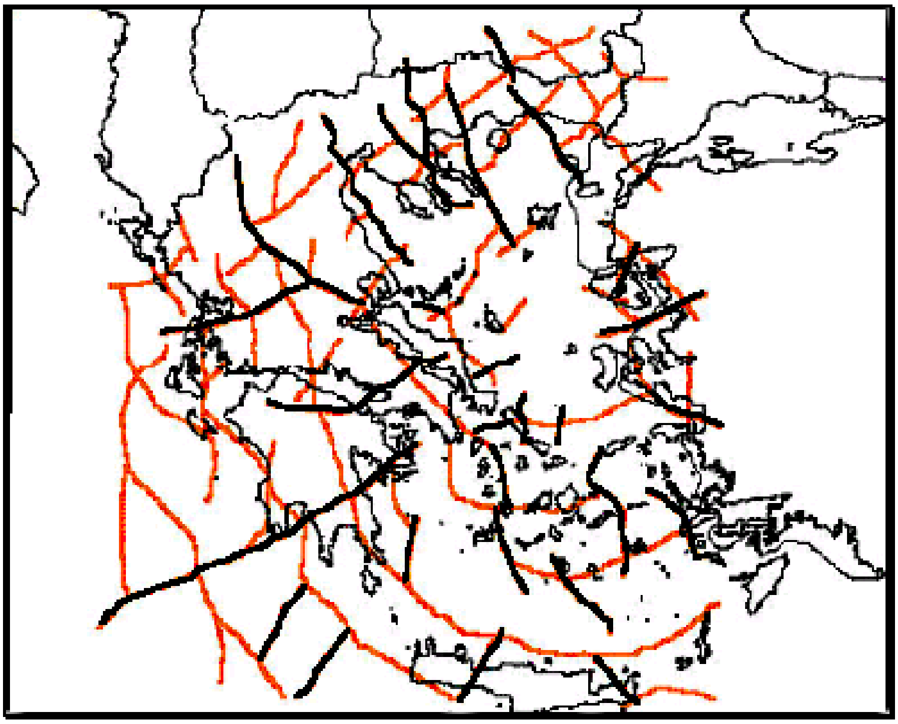

Fig. 8.7.1.2.1. Radial mode of the deep, lithosperic, fracture zones in Greece.

The fracturing pattern which is indicated in figure **(8.7.1.2.1)** can be explained in a mechanical way **(fig. 8.2.b.1),** by the uplift of the central Aegean region, due to some deeply located uprising material. Since the lithosphere upraises, there is a radial expansion developing stress, which generates this radial kind of fracturing.

The cause of such uplift was presented in the tectonodynamics literature (Doglioni et al. 2002). According to Doglioni's proposed model, the African lithosphere subducts the Aegean plate, but in the central Aegean region, the African lithospheric slab folds and upraises, producing in this way, radial, lithospheric fracturing in the Aegean plate. The model, proposed, by Doglioni et al. (2002), is presented in the following figure **(8.7.1.2.2)**.

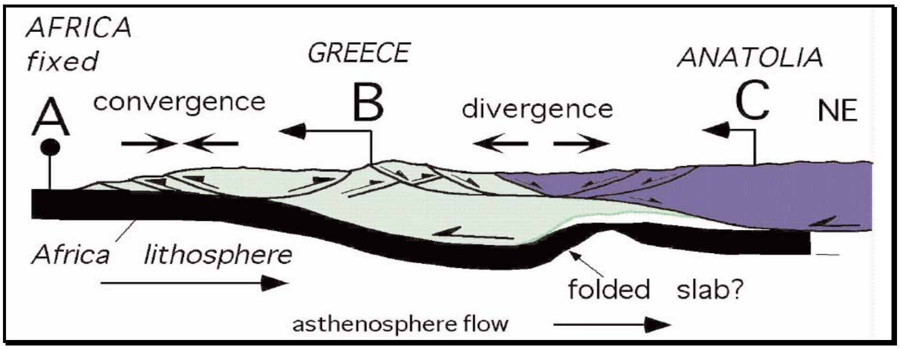

Fig. 8.7.1.2.2. Cross-section cartoon showing that Greece lithosphere (B) overrides Africa (which is considered as fixed (A)) faster than Anatolia (C), generating extension between B and C. (Doglioni et al. 2002).

It is possible that the uplifted slab of the African lithosphere simultaneously undergoes a CCW rotational movement, too.

As immediate implications of these type of deep, lithospheric, fracturing, are the generation of:

(a) geothermal fields along these fracture zones / faults shown in figure **(8.7.1.2.3)**.

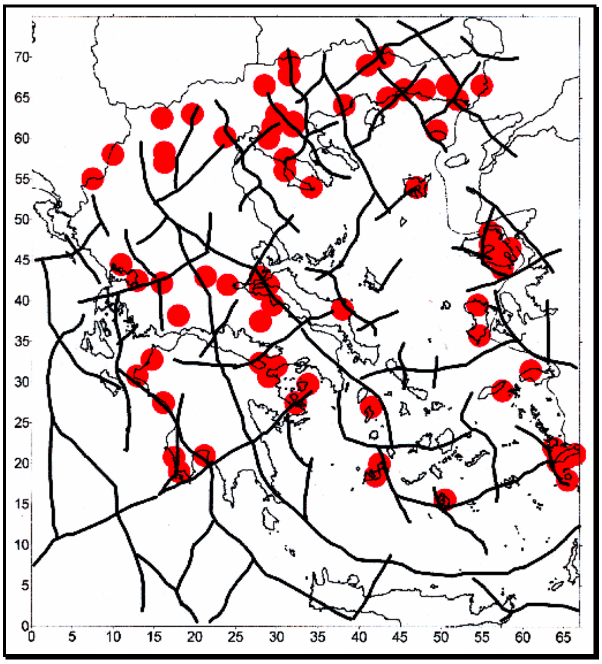

Fig. 8.7.1.2.3. The known geothermal fields (red circles), in relation to the deep, lithospheric, fracture zones, mapped, in Greece (Thanassoulas et al. 1999).

(b) hydrothermal manifestations shown in the following figure **(8.7.1.2.4)**.

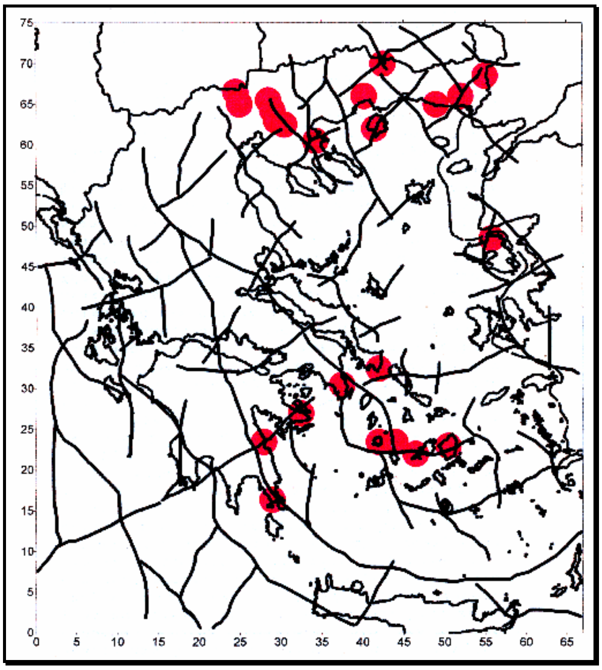

Fig. 8.7.1.2.4. The known hydrothermal manifestations (purple circles) are shown, in relation to the deep, lithospheric, fracture zones in Greece (Thanassoulas et al. 1999).

And

(c) uranium bearing deposits, shown in the following figure **(8.7.1.2.5)**.

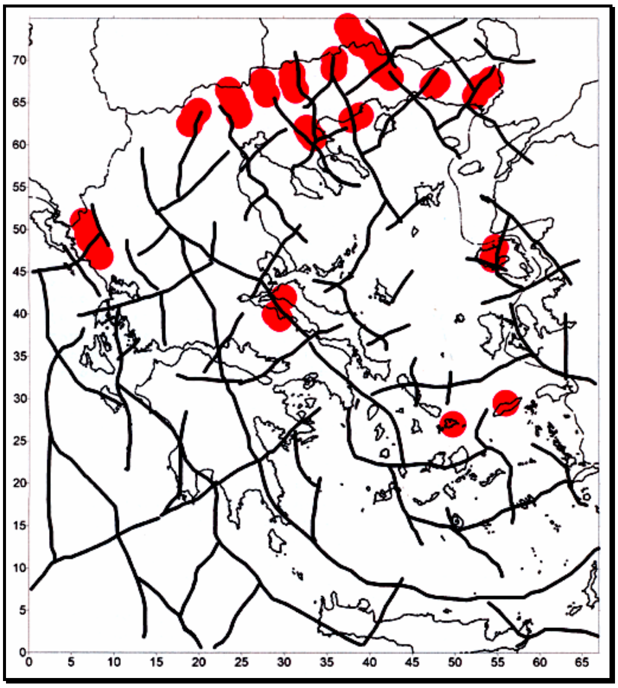

Fig. 8.7.1.2.5. The uranium bearing deposits manifestations (red circles), in relation to the deep, lithospheric, fracture zones in Greece (Thanassoulas et al. 1999).

8.8. Seismic data.

The postulated rotating, mechanical model for the Aegean plate must be reflected, too, in the seismicity of the Greek territory. As a first approach, the seismic hazard map of Greece (Papazachos et al. 1989) is presented in figure **(8.8.1)**. The main characteristics of this map are, that large-scale, discrete, seismic, hazard zones of the Aegean region are concentric. Zone **(I)**, of the lowest hazard is located in the center of the Aegean and is surrounded by zone **(II)**. The next zone **(III)** extends from the Ionian Islands to the Hellenic arc and the west part of Turkey, while minor areas distort the more or less circular pattern of the seismic hazard zoning of the Aegean region.

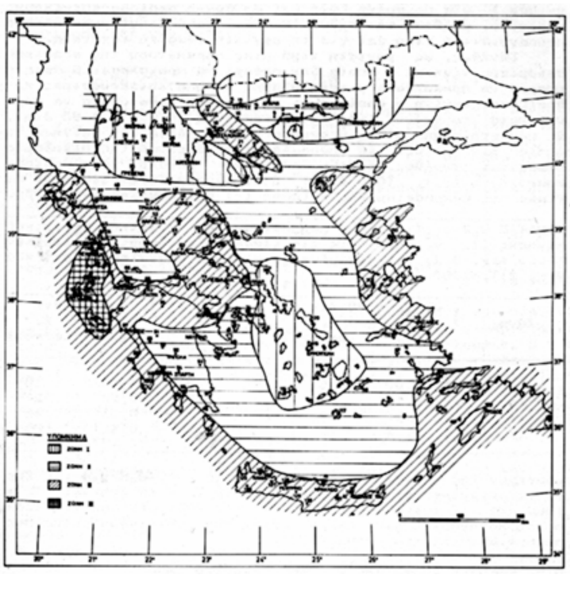

Fig. 8.8.1. The seismic hazard map of Greece (Papazachos et al. 1989) is presented. The different hatching indicates seismic hazard zoning (I = lowest, IV = highest).

A slightly different picture is presented in the lately released (OASP, 2004), seismic, hazard map of Greece. In this map only three zones are distinguished, but still the first two of the lowest value of seismic hazard retain their circular character, even though it is a bit distorted. This map is presented in the following figure **(8.8.2)**.

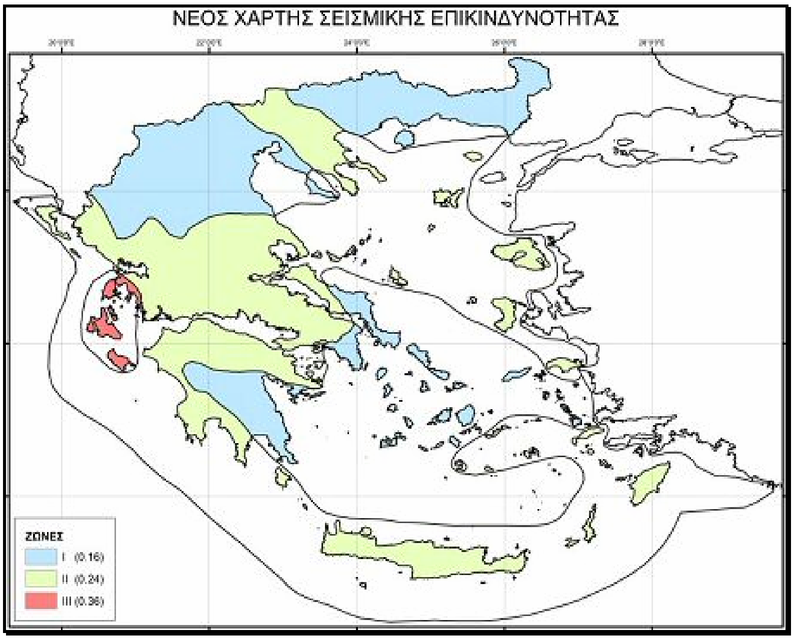

Fig. 8.8.2. Seismic hazard map of Greece (OASP 2004) is presented.

Since the fracturing of the lithosphere, follows a tangential pattern, in accordance to the circular fracturing following the rotation of the inner micro-plate of the Aegean region, in the same way, the observed seismicity in the Aegean area must exhibit a similar pattern. To this end, the seismicity of the Greek area was studied for different time intervals as follows:

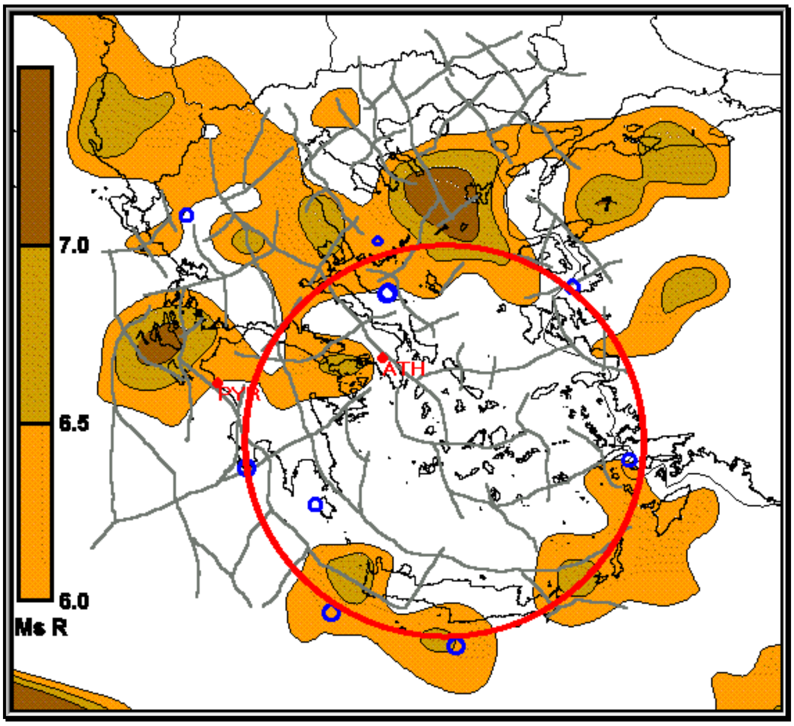

Fig. 8.8.3. Seismicity on the 13th October, 2004 is shown registered by NOA in Greece.

A single day's seismicity of Greece is shown in figure **(8.8.3)**. At a first glance, these EQs seem to have occurred randomly in space. If a circle is considered in the same area (red circle), a meaningful result comes out. These EQs occurred along tangential fracturing at the circumference of the rotating micro-plate of central Aegean.

The same test was applied over a longer period of 12 days. The results are shown in the following figure **(8.8.4)**.

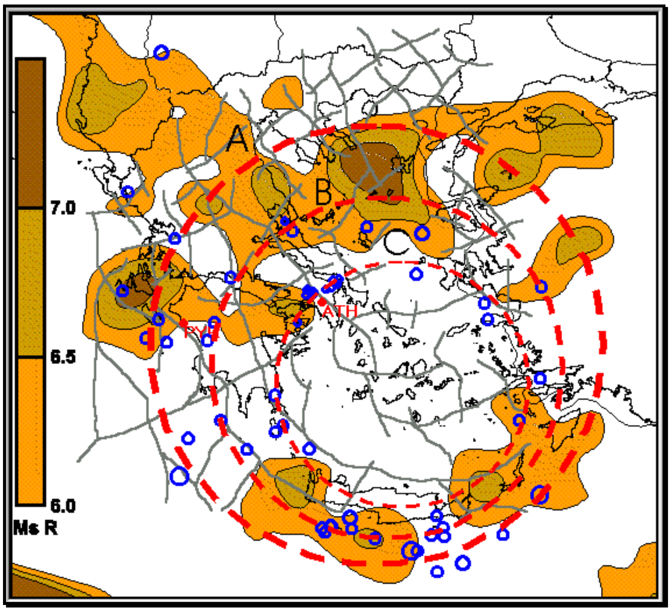

Fig. 8.8.4. Seismicity is shown for the period from 3rd October to 15th October, 2004 registered by NOA, in the Greek territory.

It is clear that the seismicity of this period of time can be grouped into three circumferences of circles which approximately have the same center.

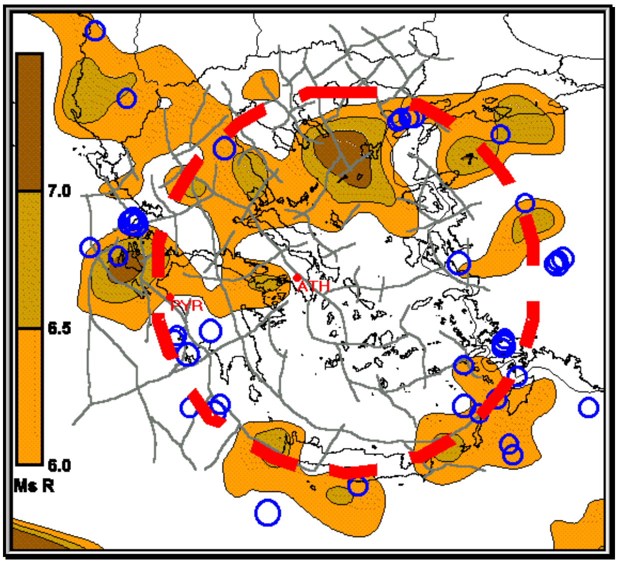

Fig. 8.8.5. Seismicity (Ms >5.0 R) is shown, registered, by NOA, for 2004, in the Greek territory.

In figure **(8.8.5)** is considered the seismicity for an even longer period (a year) and magnitude Ms>5.0R. Similar observations can be made for this case, too.

The same circular pattern is present in the seismic potential map (Thanassoulas and Klentos, 2003) of Greece. Actually, seismic energy stored in a strain form in the lithosphere, must exhibit the same behavior as the seismicity of the same area.

Finally, the seismicity for the period 1950 - 2004, 5.0>Ms>4.5R of the Greek territory was considered and is presented in the following figure **(8.8.6)**.

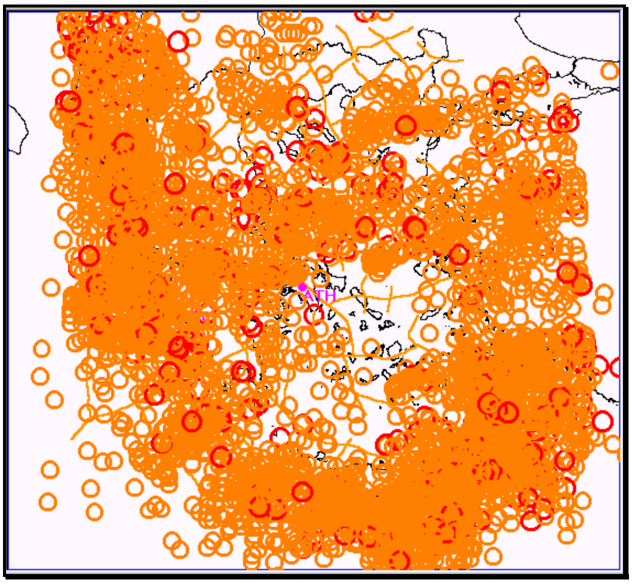

Fig. 8.8.6. Seismicity (5.0>Ms>4.5 R) is shown, registered, by NOA, for the period 1950 - 2004, in the Greek territory.

It is obvious that the circular pattern which controls the generation, in space, of the EQs, in the Aegean plate, is the rule. The hypothetical, main, tangential axis, along which the seismicity occurs, is presented by the blue dashed line in the following figure **(8.8.7)**.

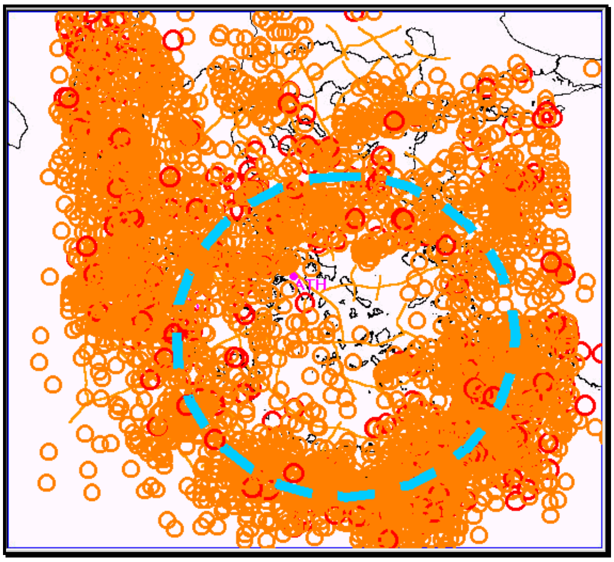

Fig. 8.8.7. Most of the seismicity of the Greek territory evolves along the main axis (blue dashed line), due to CCW rotation of the Aegean micro-plate.

A final observation in figure **(8.8.7)** is that, intense seismicity occurs along the collision of the Adriatic plate and the Aegean one. This process generates the linear axis of the seismicity which is observed at the northwest part of the Greek territory, while towards the Anatolian plate (east of the Aegean plate) northeast-southwest lineaments indicate the presence of intense, tectonic elements of the same direction.

8.9. The postulated kinematics Aegean micro-plate model.

By taking into account all the previous observations and theoretical, physical models, it is suggested that, basically, there is a southwestward drift of the Aegean micro-plate. Simultaneously the Aegean plate rotates **CCW**. This is schematically presented in the following figure **(8.9.1)**.

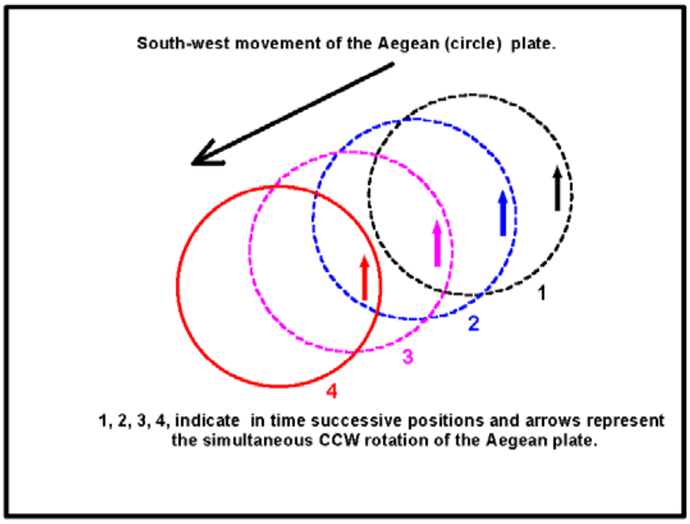

Fig. 8.9.1. Combined, main southwestward motion and **CCW** rotation of the Aegean micro-plate is presented.

This model is valid for the internal Hellenides, while in the external Hellenides a simultaneous **CW** rotation is valid for specific peripheral tectonic blocks.

In terms of the previously presented micro-plate models this movement is presented in the following figure **(8.9.2)**. Minor tectonic blocks of **CW** rotation are not presented.

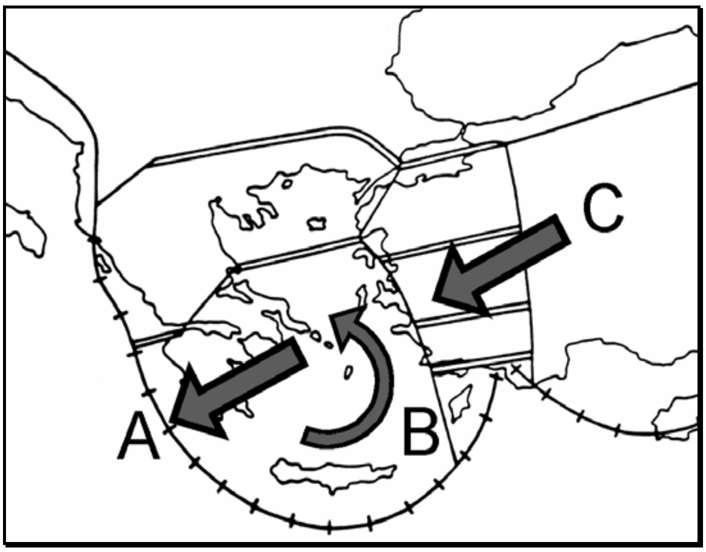

Fig. 8.9.2. The Aegean area postulated tectonic model of. **A, C** = southwest movement, **B** = counter clockwise **(CCW)** Aegean micro-plate rotation.

8.10. Conclusions.

It has been shown that, the postulated, rotational model, for the Aegean region, justifies, through a physical mechanism, the results of the different studies which are made to date and concern the Aegean kinematics. The observed, large scale, morphological data, the different results from paleomagnetic studies, the suspected, corresponding, **CCW** rotational model, the deep fracturing of the lithosphere which is obtained from gravity data, the location of hydrothermal manifestations, uranium deposits and known geothermal fields, they all conform with the proposed model.

Moreover, the proposed, rotational model provides with a new point of view, as far as it concerns, the velocity distribution of the Aegean plate movement. The low deformation (extensional) velocities which are observed in the northern Aegean area (Papazachos et al. 1996), according to the postulated model, may be well attributed to the small difference, in the same direction southwest, of the larger **CCW** rotation velocity of the rotating block of the Aegean plate and the smaller in value velocity of the southwest drift of the Aegean as a rigid block, as well. The opposite is valid for the southeast region of the Aegean region. At this place, the **CCW** rotation of the inner plate of the Aegean region is opposite to the southwest drift of the Aegean, as a rigid block, and therefore, the rotating and drifting velocities are added up, in collision, thus, resulting in a larger deformation velocity.

The later is demonstrated in the following figure **(8.10.1)**.

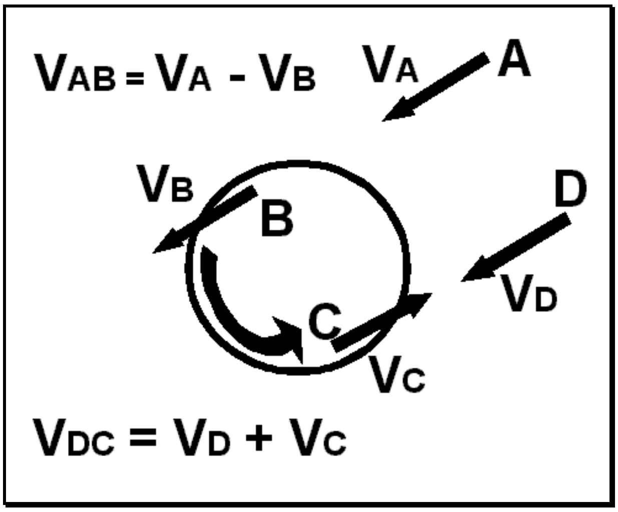

Fig. 8.10.1. The circle represents the **CCW** rotating, Aegean micro-plate. **B, C**, are locations in the rotating, Aegean micro-plate and **A, D** are locations in the Turkish plate. **V_A, V_B, V_C, V_D** denotes the velocities valid at each location.

VB is composed by the two velocity components which act on location **B**. The first one is the **SW** drifting velocity of the entire Aegean micro-plate, while the second one is the rotational velocity of the Aegean micro-plate at location **B**. At location **B**, **V_A** and **V_B** are co-directional, therefore, the relative velocity which is observed between locations **B** and **A** is:

$$V_{AB} = V_A - V_B \quad \textbf{(8.10.1)}$$

The very same analysis is valid for location **C**, except from the fact that the rotational velocity is in opposite direction in respect to the **SW** drifting velocity **V_D** of location **D**.
Therefore, the following equation is valid:

$$V_{DC} = V_D + V_C \quad \textbf{(8.10.2)}$$

Consequently, equation **(8.10.1)** suggests extensional forces acting on the northern part of the Aegean area, while equation **(8.10.2)** suggests compressional forces acting on the

Southeastern part of the Aegean area. In general, the change of direction of the rotational, velocity component of the Aegean micro-plate, in a **CCW** sense, modifies, accordingly, gradually the deformation velocities which are observed in the Aegean area. The latter complies very well with the observations made by Papazachos (1996) and are presented in figure **(8.1.11)**. More or less, the same is applied to the model, proposed, by De Bremaecker et al. (1982).

The next step, in this study, is to try to figure out the rotational velocity of the Aegean plate. The procedure which was adopted is as follows:

Let us recall figure **(8.1.11)**.

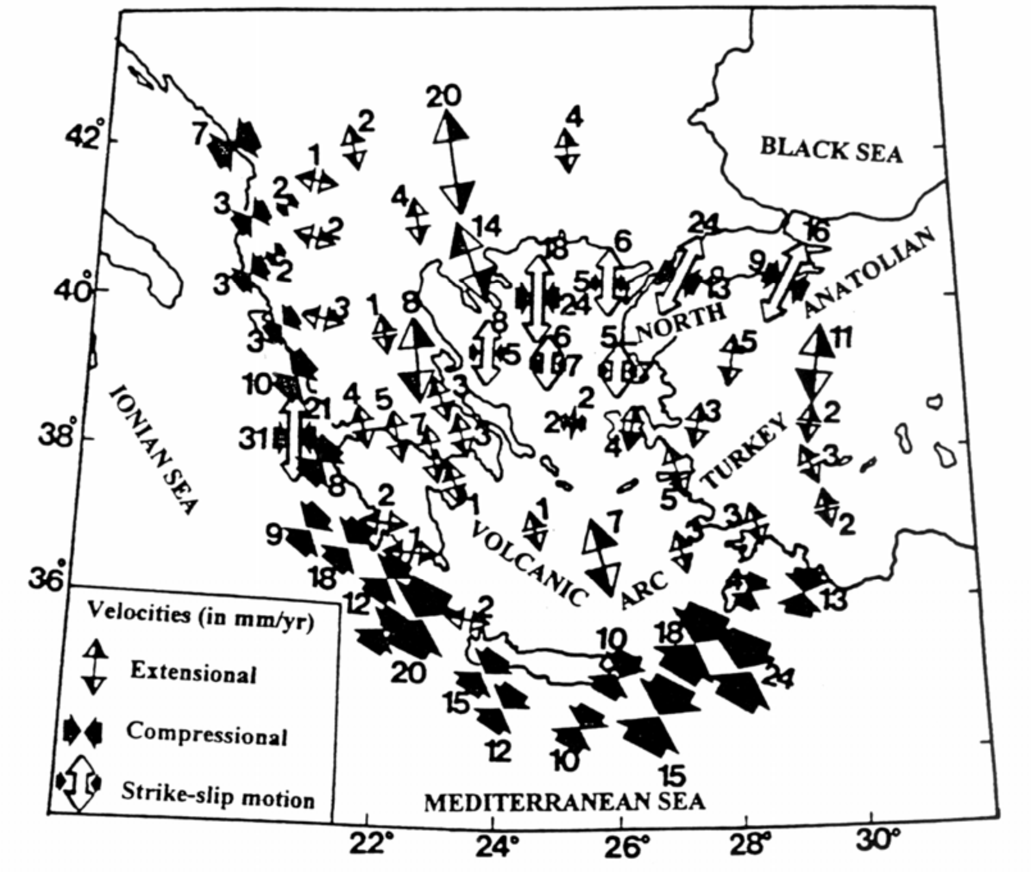

Fig. 8.10.2. Greek, seismic sources deformation velocities, after Papazachos et al. (1996).

It is assumed that the extensional and compressional deformation velocities, which are observed at the northern and southern part of the Aegean plate, correspond to the combined effect of the rotational velocity **(V_r)** of the Aegean plate and of the SW-ward, drifting velocity **(V_d)** of it. The value of the extensional deformation, observed, at the northern part of the rotating Aegean plate, is almost **8mm/year**, while the value of the compressional deformation velocity, observed, at the southern part of the Aegean plate, is **24mm/year**. Consequently, the following equations hold:

$$V_r - V_d = 8mm/y \qquad (8.10.3)$$

$$V_r + V_d = 24mm/y \qquad (8.10.4)$$

Solving equations **(8.10.3)** and **(8.10.4)** for **V_r** it is calculated that:

$$V_r = 16\ mm/year \qquad (8.10.5)$$

Moreover these observed velocities, following the postulated, rotating, mechanical model, are tangential to the perimeter of the rotating Aegean block **(fig. 8.10.3)**.

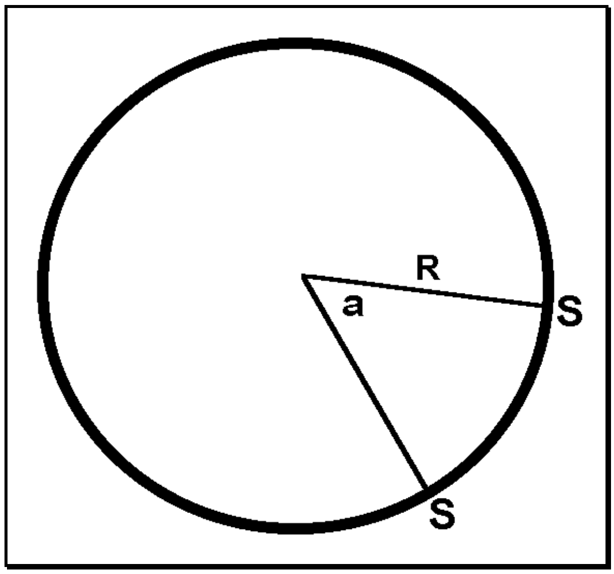

Fig. 8.10.3. The rotating Aegean block is represented by a circle. **a** = angular velocity, **R** = radius of the block, **S-S** distance in mm traveled within a year **(V_r)**.

Therefore, the following equations hold:

$$V_r = a * R \qquad (8.10.6)$$

$$a = 2 * \pi * T^{-1} \qquad (8.10.7)$$

where T^{-1} denotes the rotational frequency of the Aegean plate. The average radius **(R)** of the rotating block is estimated from the following figure **(8.10.4)**.

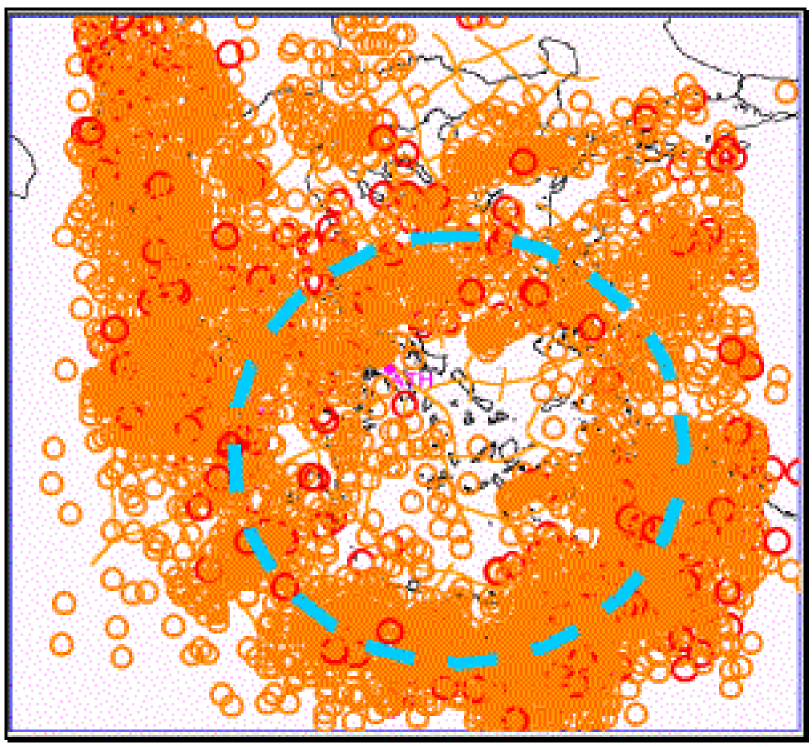

Fig. 8.10.4. Estimated average value of radius **R** of the rotating block is: **R = 290Km.**

From equations **(8.10.6)** and **(8.10.7),** the period for a full rotation of the Aegean block is calculated as:

$$T = 2\pi R/Vr = 6.28 * 290 * 106 / 16 = 113.8mY \qquad (8.10.8)$$

This result and the seismicity pattern of figure (8.10.4) imply that the Aegean block has completed, at least, a full rotation since the Upper and Middle Jurassic, when the Orogenesis and the large scale, tectonic events took place in the Hellenic area. Its actual start can be some million years back in the geological times (Middle and Lower Jurassic).

A remark, concerning the reason of the absence of intense seismicity in the central Aegean region, must be made. According to this model, since the inner plate rotates, the most central parts of it are less subject to tangential stresses (which are the main cause of earthquake generation) so it results in less seismicity, which is reflected in the seismic, hazard map of Greece, the seismic potential map of Greece and in the seismicity map of Greece for the period 1950 - 2004. This is a completely different explanation from the one which is believed by the seismologists, who suggest that a liquid magma plum is ascending in the same area.

Finally, as long as the Aegean block rotates, the occurrence of a strong earthquake, anywhere on its perimeter, changes its stress load tangentially and therefore, it is more likely for another strong earthquake, provided that the stress load is adequate, to occur in a place, so that the mechanical balance of the rotational plate will be maintained. Such a place is more or less the symmetric position on the diameter, connecting the two places of the EQ that occurred and the next EQ to follow, in the future.

Let us assume that the solid circle represents the Aegean plate that rotates in **CCW** mode with a rotation center of **(C1)**. In place **(A),** of its circumference, a strong EQ takes place, due to large, tangential stresses, already accumulated. As a result, the location of **A** moves towards the location **A'** due to the tangential forces which are applied at the rotating Aegean plate. In such a case, the Aegean plate rotational center **C1** should move towards the location **C2.** This implies that the entire Aegean plate "rolls", due to tangentially applied forces. This mechanism is presented in the following figure **(8.10.5)**.

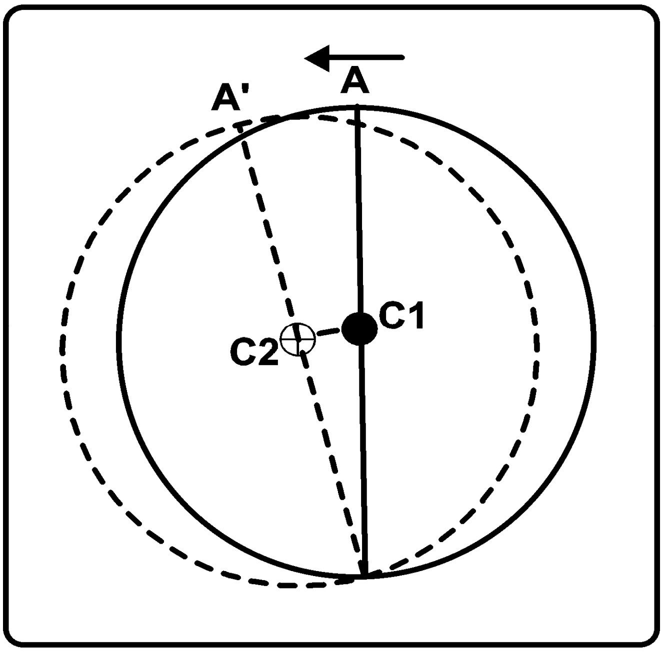

Fig. 8.10.5. At the circumference of the rotating Aegean plate (solid circle) an EQ occurs in place **A**. The location **A** moves towards the location **A',** while the center of the rotation moves from **C1** to **C2**. Dashed circle indicates the new position of the "rolling", Aegean plate.

This mechanism is not possible, as long as these forces are applied all along the circumference of the Aegean plate and represent the forces that create, solely, the rotational moment only. Therefore, in a rotating, physical system like this, the occurrence of an earthquake, anywhere in its perimeter, will induce the occurrence of another one, in an antisymmetric location, so the that mechanical rotational moment will be preserved and the rotation center of the system itself will remain stable. This is presented in the following figure **(8.10.6)**.

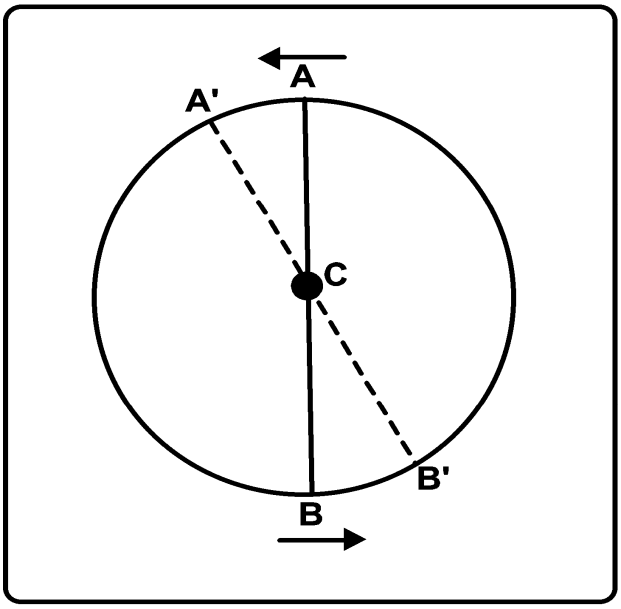

Fig. 8.10.6. A strong EQ takes place in the circumference (location A) of the Aegean plate (solid circle). Movement of A towards A' is counterbalanced through another antisymmetrically, located Earthquake, in location B which moves correspondingly to B'. As a result, the rotational center **(C)** of the Aegean plate remains stable.

This mechanism provides a physical explanation of the so-called "domino effect", observed, by the seismologists in some cases of strong EQs in the Aegean plate.

It has been shown that, the postulated, rotational model for the Aegean region, justifies, through a physical mechanism, the results of different studies, made to date, concerning the Aegean kinematics. The large scale, observed morphological data, the different results from paleomagnetic studies, the suspected corresponding **CCW** rotational model, the deep fracturing of the lithosphere obtained from gravity data, the location of hydrothermal manifestations, the uranium deposits and the known geothermal fields, they all conform with the proposed model.

Moreover, the proposed rotational model provides with a new point of view, which concerns the velocity distribution of the Aegean plate movement. The observed low deformation (extensional) velocities in the northern Aegean area (Papazachos et al. 1996), according to the postulated model, may well be attributed to the small difference, in the same direction southwest, of the larger **CCW** rotation velocity of the rotating block of the Aegean plate and the smaller, in value, velocity of the southwest drift of the Aegean, as a rigid block. The opposite is valid for the southeast region of the Aegean region. At this place, the **CCW** rotation of the inner plate of the Aegean region is opposite to the southwest drift of the Aegean, as a rigid block, and therefore, the rotating and drifting velocities are added up, in collision, resulting in a larger deformation velocity.