NOTE ON THE TECTONIC POSITION OF THE NORTHERN AND CENTRAL ANATOLIA

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Various considerations have already been made on the tectonic position of the Northern Anatolian mountain chains which form the morphological continuation of the Carpathian and the Northern Balkan chains. As for instance, for E. Argand[1], the alpine foldings in Europe extend to the east directly through southern Anatolian and southern Iranian mountains, while Northern Anatolian and Caucasus mountains form only a secondary folding system. L. Kober[14], considers the Northern Anatolian mountains together with the Northern Alps, Carpathian and Northern Balkan foldings as Northern Wing of the alpine orogenic systern; on the other hand he puts the Southern Anatolian mountain together with the Soutthern Alps and Southern Balkan foldings (Dinarique Mountains) in Southern Wing of the Alpine orogeny. J. Nowack[17] and W. Salomon-Calvi[19] admit on the contrary that, the tectonical line which is called now «Northern Anatolian Seismic Belt» is the boundary between the two wings of the orogeny; that is to say, they put the section of the Northern Anatolian foldings situated farther to the north of this line in the orogeny's Northern wing and the remaining section located to the South of the line together with the Central Anatolian Massives in the Southern wing of the orogeny. E. N. Egeran[11], who has taken into consideration the geological studies done for the Geological map of Turkey and especially the tectonic units established in the neighbouring countries, believes that the Northern Anatolian foldings form the orogeny's Northern wing, the Southern Anatolian foldings its Southern wing and the massives developed in the Central Anatolia (like the Kırşehir Massive) represent the Intermediary zone between the two orogenic wings. Lately, E. B. Bailey and M. J. McCallien[3], assuming a secondary tectonic unit folded southward (but in reality belonging to the Northern Anatolian foldings) as extending in the Kırşehir Massive, believe that this massive constitutes a huge klippe and thus they put the Southern section of the Northern Anatolian foldings together with the Southern Anatolian foldings. Owing to all these controversial viewpoints, we believe useful and necessary to revise some stratigraphical and tectonical bases of the Northern and Central Anatolia in order to clarify their real position.

Stratigraphic Observations

The pre-mesozoic basement of the Northern Anatolian foldings, in the north -i. e. Pontides and Northern part of Anatolides- is mostly formed by the fossiliferous paleozoic sediments and the schists and graywackes slightly metamorphosed, rather than the plutonic

rocks and highly metamorphic crystalline rocks. This basement fossiliferous Silurian graywackes, fossiliferous Devonian limestones, a thick continental-limnic carboniferous series containing coal seams (in the North), fossiliferous marine Permo-carboniferous limestones, marbles (in the South), graywackes and non-fossiliferous schists.

This basement is covered by a thick sedimentary cover extending from Triassic up to Eocene. Among these cover beds, various limestones belonging to the Middle and Upper Triassic, Jurassic limestones, flysch series attributed to Lias, Lower and Middle Cretaceous limestones and shales showing different alpine facies, Upper Cretaceous flysch and marine Eocene series formed by flysch and limestones are commonly found. In the Eastern Pontides large volcanic nappes, attributed to Cretaceous and Eocene, are also present. On the stratigraphy of Northern Anatolian foldings much has already been published by different authors as for instance, P. Arni[2], M. Blumenthal[5-8], R. Egemen[10], W. Grancy[13] and .V. Kovenko[14a].

On the other hand, in the Kırşehir massive considered by Bailey and Mc Callien as a part of Anatolides, Eocene transgression is found directly on a basement formed by granites, diorites, mica-schists and large grained contact marbles, as againstan entire Marine Mesozoic - Eocene found in Anatolides.

The Eocene deposited on top of the Kırşehir Massive is composed of a continental facies containing lignite seams in the lower and of a marine section in the upper part Arni[?a]. That is to say, Kırşehir Massive and Anatolides - Pontides are stratigraphically. entirely different from each other. As for the Southern part of Northern Anatolian folds (Anatolides) attributed to Southern Anatolian folds (Taurides) by Bailey and McCallien : undoubtedly, the mesozoic zone (limestone, flysch, radiolarite and green rocks) forming that pait of the Anatolides, has a close resemblance to the Mesozoic of the Taurides in the Northern parts of the Southern Anatolian foldings. But it must be born in mind that the Anatolides as well as the Taurides were deposited under the same geological conditions in series in the Central part of the orogenic zone. In general, the facies of formations under similar geological conditions are the same; as for example, there is no difference whatsoever, in the facies of rocks forming the highest nappes of northern and southern alps and deposited in the central section of orogeny. Therefore, the existence of the same rocks and formations in Northern Anatolides as well as Southern Taurides, two tectonic units altogether different from one another, is quite natural.

Tectonic Observations

The Anatolides and the Pontides are massives pushed towards the north, that is from the inner part of orogenic zone to the northern border. In areas more closely studied from a tectonic point view, such as in the straights of Bosphorus[9] in Şile[4] between Bolu and Yeşil Irmak[5-3], around Samsun, Gümüşhane, between Oltu and the river Çoruh (E. L.), there are folds, thrusts, ecailles and nappes pushed to the north. Reverse movements (north to south) are also noticed with northward thrusts forming, continuously, the regional orogenic movements. Those reverse folds are particularly noticeable in the inner border (South)

of Northern Anatolian folds and along the grabens of North Anatolia seismic belt. As with all the inner borders of orogenic wings, regional foldings towards fore-deep are noticeable in the inner border of Northern Anatolia folds (Anatolides); likewise, Eocene and Cretaceous beds thrusted on Oligocene gypsiferous formation in the border of Delice Irmak river basin (near Çankırı and İskilip) are noticeable also, folds of green rocks and cretaceous flysh, pushed to the South are noticeable between Sivas and Divrik. The fact that some of the reverse folding formations are thrusted on Oligocene series E. Lahn[15], shows that the reverse folding is a posthume of orogenic phase, and that these movements are closely connected with Intermediary Massives. In this region orogenic movements have ended before Oligocene and Oligocene series cover the Alpine folds of Anatolides in the form of transgression.

Reverse folds originated by other movements, movements poitend out by M. Blumenthal[5-8] in regions of Bolu-Gerede - Tosya, along the Ulusu line North of Bolu or in the region of Ladik-Erbaa, are only series thrusted to North Anatolia seismic belt. Downward and upward blocks have occured along this belt at least since the Cretaceous, and the series bordering these downward blocks originating from these movements, have partly been either slid or pushed towards this zone. As against the orogenic movement with a regional character towards North, these reverse folds have always a local character; very close to series thrusted to the South, series continuously folded to the North are also noticeable. Consequently, Anatolides and Pontides, are massives pushed to the foreland, to the North in orogenic phase; reverse foldings seen in this massive are purely local accidents connected with the secondary movements in the borders of the massive in cratogenic lines as in North Anatolian seismic belt.

A huge massive of the size of Kırşehir Massive can never be thrusted in the form of an indepedent klippe. Such a klippe, could only be the remnant of a huge nappe pushed in the first place from Anatolide-Pontide zone to Kırşehir Massive, then destroyed by erosion. İn other words, the zone stretching between, what is called to-day, Pontides and Kırşehir Massive, must have been under the pressure of a huge thrusted block during orogenic thrust movements. The tectonic degree of this zone, is a deep tectonic, and should be dynamometamorphosed as Alpine «Pennide» degree. Whereas, the tectonic aspect of the rocks and series (Limestone, flysch, radiolarite, green rocks and graywackes) forming the Anatolides between Pontides and Kırşehir Massive, called «Ankara melange» by Bailey and McCallien, is in complete disorder, and was formed during wide and strong tectonic movements; the tectonic of this zone is not the tectonic of series covered by thick thrusted block, but a superficial and free tectonic, and the said formations are not dynamometamorphosed. The, fact that Kırşehir Massive is not derived from Anatolides-Pontides can easily be understood from the metamorphism degree and the tectonic of Anatolides in between. For example, the position of green rocks covered by thick thrusted blocks can be studied in green rocks in Alpine pennide nappes, where tuffs are changed to chlorite schists and agglomerates are completely laminated. Whereas, «pillow lavas as found in the green rocks of Anatolides and explained by McCallien are with their

tuffs. On the other hand, it is argued by the same writer that these green rocks are covered by a thrusted block stretching from Pontides to Kırşehir Massive.

North Anatolian folds are not independent units, but a part of alpine orogenic system continuing beyond the Turkish border. Pontides which are the outer foldings, end in East Bulgaria in the West and are replaced by a unit called prebalkanic flysch zone. As for the massives forming the Anatolides, they remain as they are with all their tectonic and stratigraphic characteristics, stretching to Carpathian along the Danube valley. This unit called the High balkanic nappes is thrusted and folded in the North foreland from Istranca to Carpathian[11]. As to zones in Eastern Turkey, it is understood from Russian publications that Armenian foldings, forming a continuation of Anatolides are also folded towards the foreland[18].

Contact between Anatolides and Kırşehir Massive

Some basic points are clarified above regarding the tectonic of Northern Anatolia folds and Kırşehir Massive. In conclusion, the writers find it necessary to describe a contact observed by them showing the tectonic relations between Anatolides and Kırşehir Massive.

Generally, a zone filled with Neogene and Oligocene strata stretches between Anatolides and Kırşehir Massive, and although a direct contact does not exist between the two massives, the rocks forming the fold system separated from Anatolide folds and stretching from South, to central Anatolia, called by us as «Yozgat-Çorum fan», is in contact with Kırşehir massive North, West of Yozgat.

As we move from North West to Yozgat, we notice a transition to hard stratified yellow limy marl and fine grained sandstone in Eocene flysch composed of grey argillaceous strata containing many lutetian fossils, forming the Southern border of the fan.

Kabaktepe, in North-Northwest of Yozgat, is formed of series containing little nummulites partly silicified by bazaltic dykes. But in Southern foot of Kabaktepe, the yellow marl forming the continuation of Anatolides Eocene flysch, covers transgressively the Kırşehir Massive granites and diorites. Int other words, instead of the rocks of Kırşehir massive being under the Anatolides Eocene as put forward by Bailey and McCallien, it is actually coverig the rocks of this massive.

Conclusion

Stratigraphically North Anatolian folds and Kırşehir Massive are units altogether different from each other.

It is understood from studies and observation in Northern Anatolia and in silicified beds abroad, that Northern Anatolia folds are units thrusted to Northern foreland of the orogenic zone. Reverse (Southward) movement contrary to the general movement towards the foreland, are either a tectonic movement in the final phase on massive borders, or secondary accidents in cratogenic lines.

Although the tectonic of the section of Anatolides, called «Ankara Melange» by Bailey and McCallien, and spread between Anatolides - Pontides and Kırşehir Massive zone, is rather mixed, those series are not dynamometamorphic, and the tectonic of this formations is the equivalent of free and superficial tectonic not covered by heavy thrusted massive. Which means

that, the rocks forming the Kırşehir Massive hade never been over that zone.

The Kabaktepe section observed in the NNW of Yozgat, shows clearly that the Eocene of Anatolides covers transgressively the Kırşehir Massive rocks.

We believe finally that, the Northern Anatolian foldings represent a part of Northern wing of the Alpine orogenic system which has been pushed towards the Northern foreland, and that the Kırşehir Massive constitutes a portion of the Intermediary Massives located between Northern and Southern wings of the orogenic system,

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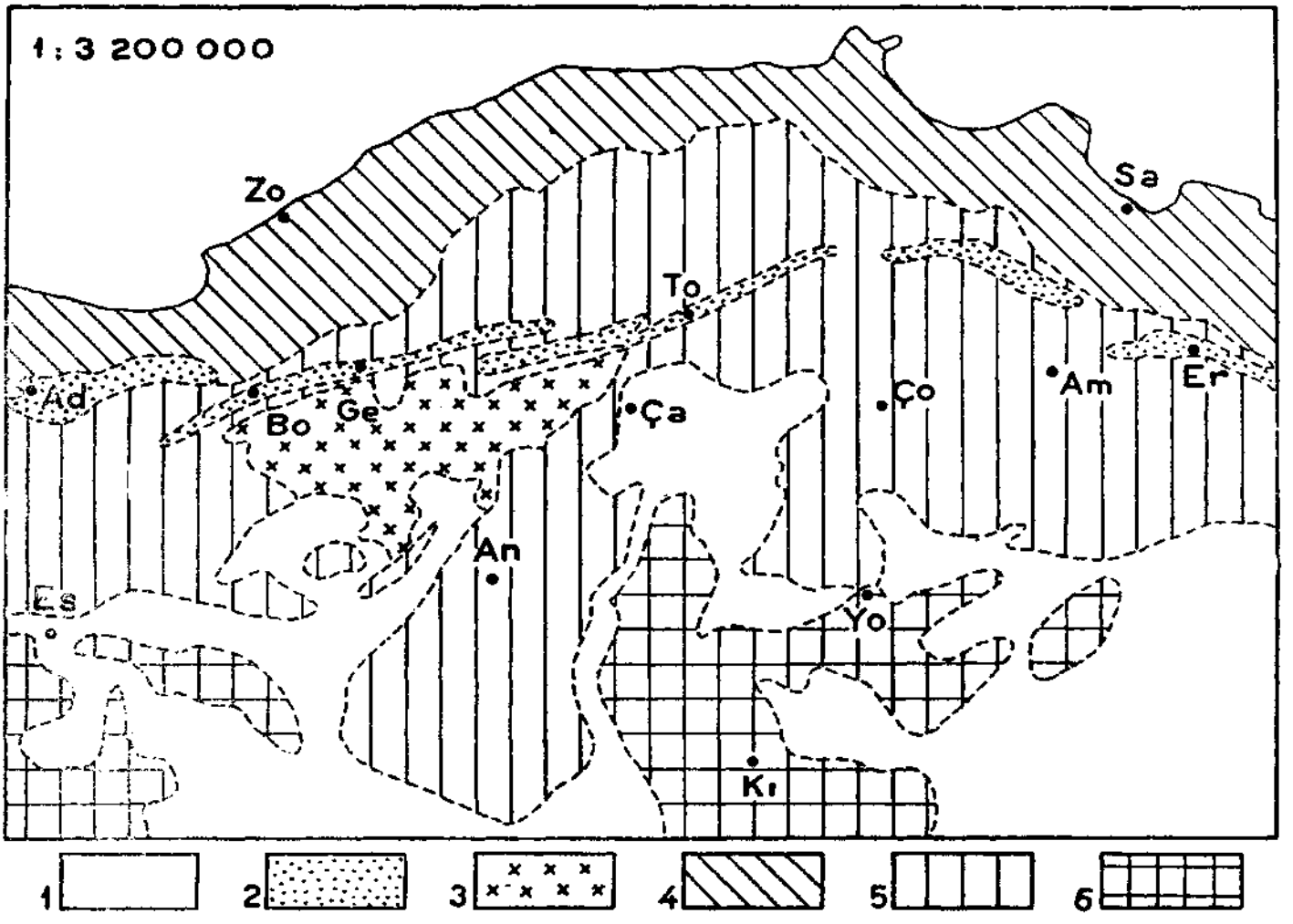
KUZEY VE ORTA ANADOLU'NUN TEKTONİK DURUMUNU G6STERİR KROKİ

MAP SHOWING TECTONICS OF NORTHERN AND CENTRAL ANATOLIA

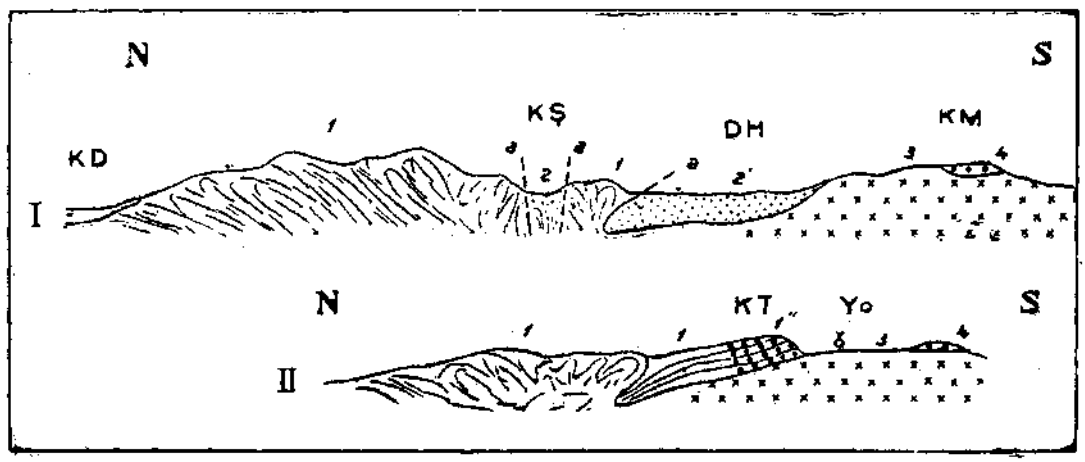


1. — Orta Anadolu Neojen ve Oligosen havzaları.
   Neogene and Oligocene basins of Central Anatolia.
2. — Kuzey Anadolu Deprem şeridine bağlı olan [illegible]
3. — Ankara volkanik sahası.
   Volcanic zone of Ankara.
4. — Pontid Iltivaları.
   Pontides foldings.
5. — Anatolid Iltivaları.
   Anatolides foldings.
6. — Ara masif.
   Intermediary massive.

Ad: Adapazarı, Am: Amasya, An: Ankara, Bo: Bolu, Ça: Çankırı, Ço: Çorum, Es: Eskişehir, Er : Erbaa, Ge : Gerede, Kı: Kırşehir, Sa : Samsun, To : Tokat, Yo :- Yozgat, Zo : Zonguldak.

KUZEY ANADOLU İLTİVALARI İLE KIRŞEHİR MASİFİ ARASINDAKİ TEKTONİK İRTİBATI GÖSTEREN MAKTALAR (ÖLÇEKSİZ)

Cross sections showing relations between north Anatolia foldings and Kırşehir Massive



1 — Paleozoik - Mesozoik - Eosen arazileri
Paleozoic - mesozoic - Eocene Series

1'— Kuzey Anadolu iltivalarının güney kenarını teşkileden Eosen flişi
Eocene flysch bordering southern part of

1"— Kabaktepe Eosen kalker ve greleri
Eocene limestone and sondstone of Kabaktepe

2 — Kuzey Anadolu deprem şeridi içindeki havzaların Neojeni
Neogene in the basins of Northern Anatolia seismic Belt

2' — Orta Anadolu Oligosen ve Neojen serisi
Oligocene and Neogene series of Central Anatolia

3 — Kırşehir Masifi sahreleri
Cristalline rocks of Kırşehir Massive

4 — Kırşehir Masifi Eosen transgresyonu
Eocene transgression on Kırşehir massive

a: Kratojenik tektonik arızalar
Cratogenic faults.

KD: Karadeniz, KŞ : Kuzey Anadolu Deprem şeridi, DH : Delice Irmak Havzası, Kı: Kırşehir Masifi, KT : Kabaktepe, Yo : Yozgat.