CAMBRIAN OUTCROPS IN SOUTHEASTERN TURKEY AND THEIR COMPARISON WITH THE CAMBRIAN OF EAST IRAN

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INTRODUCTION

This paper summarizes the results of an investigation of the Paleozoic formations— especially the Cambrian— of Southeastern Turkey, carried out during the summers of 1963 and 1964.

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The Cambrian formations described in this paper include the classical sections of Derik, the outcrops near Penbeğli-Tut, Adıyaman district, and those of Hassa in the central Amanos Mountains. Figure 1 shows the Cambrian exposures mentioned above, in numerated circles (1, 2, 3).

The Cambrian outcrops of Southeastern Turkey and the Cambrian of East Iran, between Kerman and Sagand, are similar to each other in many aspects. The main purpose of this article is to compare the Cambrian formations of these two areas.

I. CAMBRIAN OF DERİK REGION

H. F. Moses, when he studied the Paleozoic sequences near Derik in 1936, mentioned the presence of the pre-Carboniferous formations in this region. S. W. Tromp (1941), and N. Tolun & Z. Ternek (1952) investigated the Paleozoic sequences of Derik in detail and collected a rich Trilobite fauna from this area. This was determined as Cambrian by Stubblefield of the British Museum.

The Derik region has since become a classical visiting place for petroleum geologists working in Southeast Turkey.

The Cambrian formations exposed between Derik and Değirmenli (Sosink) form a monoclinal series dipping to the south (Fig. 4). It is possible to divide this series, from bottom to top, into four different units. These are :

a. Telbismi formation (C_c) (Infra-Cambrian or Eo-Cambrian)

This formation crops out around the villages of Telbismi and Kurtan, near Derik. It consists of a series of volcanic facies including submarine lavas, tuffs and agglomerates. There are also red-colored sandstones and shales interbedded with magmatic materials. Both of these rock types, volcanic and sedimentary, are well stratified. They generally strike E-W and dip to the south (Fig. 4).

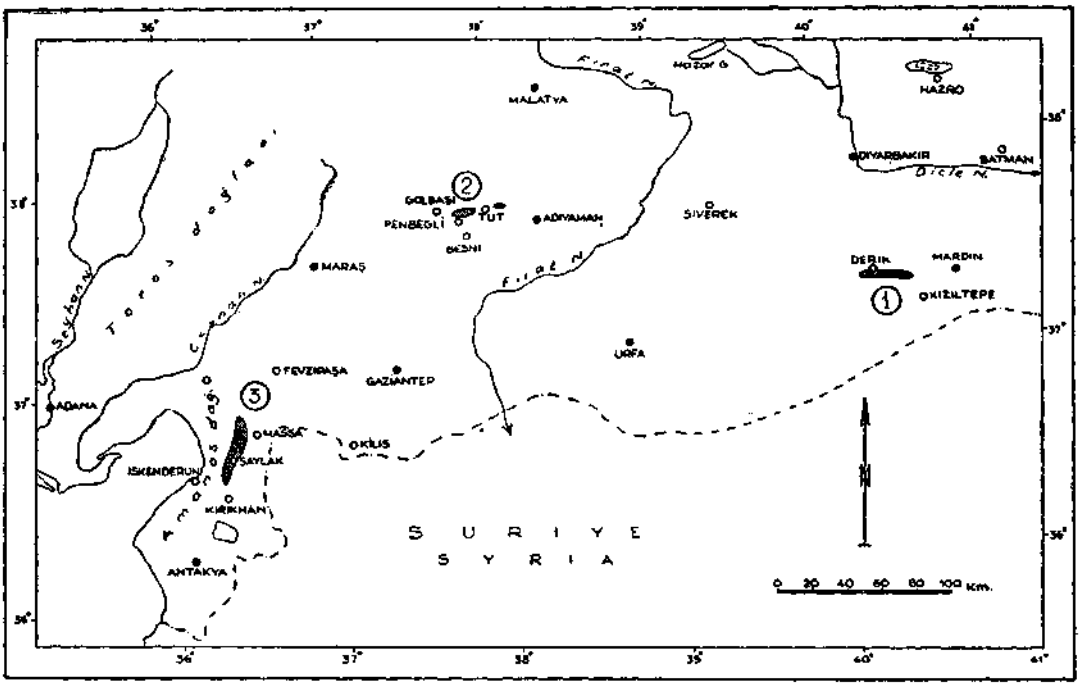


Fig. 1 - Index map showing localities of the Cambrian outcrops in Southeastern Turkey.
1 - Derik region; 2 - Penbeğli-Tut region; 3 - Hassa-Saylak region (Amanos Mountains).

The magmatic components of the Telbismi formation consist of different kinds of andesites, basalts, augite-andesite (An 38), spilites, volcanic breccia and tuffs. The sedimentary constituents of the formation are, on the other hand, reddish sandstones and shales intercalated with volcanic sequences. The thickness of the sedimentary layers, which form eight different horizons, varies from two meters to thirty meters.

The thickness of the volcanic series is several hundred meters.

The whole thickness of this formation, as measured in the field, is above 2000 m.

Since no fossils were detected in the sedimentary rocks, the age of the Telbismi formation could not be determined precisely. However, because it is the lowest part of the complete series and lies beneath the fossiliferous Middle Cambrian formation, it can be inferred that the Telbismi formation is of early Cambrian or Infra-Cambrian (Eo-Cambrian) age.

Although the volcanic rocks of the Telbismi formation are suspected to be of Precambrian age by some geologists, the author, can not agree for the following reasons:

1) There is no angular disconformity between the Telbismi formation and the overlying sandstone beds.
2) The volcanic materials are well stratified and interbedded with the sedimentary layers.
3) It makes up a conformable series with the fossiliferous Middle Cambrian appearing at the higher level (Fig. 4).

Therefore, it appears that the Telbismi formation is Cambrian, or, at least, early Cambrian (Eo-Cambrian) in age.

The Cambrian formations between Kerman and Sagand in East Iran and the lower part of the Cambrian of High Atlas have been also developed in volcanic facies.

b. Sadan formation (C_1)

The top level of the Telbismi formation consists of colored sandstones and shales covered by a conglomerate layer 20-25 m thick. With these conglomerates containing volcanic pebbles from the Telbismi rocks the new formation, called Sadan, begins:

No observable unconformity between the two formations, Telbismi and Sadan, were found. On the contrary, they appear to form a continuous series. The conglomerates, including volcanic pebbles from the Telbismi formation, indicate a slight uplift during Cambrian time. The transition from the Telbismi formation into the Sadan can be observed near the village of Sadan and is shown on the Plate I,P_1 and Fig. 4. The sequence of the layers in this transition area is as follows :

Sadan formation	Red sandstones, thick- and cross-bedded	110 m
	Fine-grained, thin-bedded sandstones	40 m
	Conglomerate (III) consisting of small pebbles	5 m
	Red sandstones and shales	64 m
	Sandy limestones containing red cherts	22 m
	Red sandstones	11 m
	Conglomerates (II) including volcanic pebbles	32 m
	Red sandstones, thinly bedded	28 m
	Conglomerates (I) containing volcanic pebbles	22 m
Transition	*slight disconformity*	
Telbismi formation	Red sandstones and shales	92 m
	Andesites and spilites	37 m
	Red sandstones	29 m
	Andesitic lavas, weathered and sericitized	400 m

The Sadan formation mainly consists of reddish and cross-bedded sandstones. It also contains thin layers of quartzites, fine-grained shale beds and sandy limestones with chert intercalations at the bottom level. The sandstones generally have a siliceous matrix, but it may also be ferruginous or micaceous.

The total thickness of this formation is 680 meters, 250-300 m of which are made up of red-colored, cross-bedded and coarse-grained sandstones with high porosity. There are some sections exposed near the village of Sadan and along the trail to Koruk.

No fossils have been found in these clastic sediments. According to regional stratigraphy, the Sadan formation belongs to the lower part of Cambrian, or it makes up what is considered to be the normal «Lower Cambrian».

c. Dolomite formation (C_2) of Derik region

The thin-bedded red sandstones of the Sadan formation gradually pass into dolomites and dolomitic limestones which form the dolomite formation of the Cambrian sequence. The lower part of this dolomite series is composed of sandy dolomites with thin chert layers; the middle part of thick-bedded, compact dolomites and the upper part of thin-bedded, dolomitic limestones. The thickness of the formation was found to be 260 meters.

Dolomites and dolomitic limestones are mostly crystalline. They have a minimum porosity, contain no fossils and are, therefore, sterile.

The dolomite formation of the Cambrian, which is generally developed in clastic facies, seems to be a suitable key-horizon for correlation of the Cambrian outcrops in Southeastern Turkey and East Iran. They are also assumed, in both countries, to be of Lower Cambrian age.

d. Sosink or Koruk formation (C_3) (The fossiliferous Middle and Upper Cambrian)

Near the village of Koruk, the thin-bedded limestones of the dolomite formation are seen to pass into the colored marls and nodular limestones (transition beds) of a new formation named «Sosink» or «Koruk». It is a clastic series consisting of gray shales, siltstones, sandstones and quartzites at the top level. Like the other Cambrian formations, it forms an east-west trending and to the south dipping band (Fig. 4).

The lower part of the formation exposed near Koruk is made up, from base to top, of the following sequence :

Colored, thin-bedded limestones and marls, partly nodular. . . . . 31 m
Interbedded limestones and fine-grained shales. . . . . 14 m
Fossiliferous (Trilobites) limestones, shales and siltstones. . . . . 140 m
Intercalation of shales and siltstones containing thick sandstone beds.... 92 m

The whole thickness of the Sosink formation is aproximately 1100 meters.

The Sosink formation is the only one below the Cambrian series which contains fossils. The lower part of the formation is particularly rich in fossil organisms, characteristic of the Middle Cambrian, such as Trilobites (Paradoxides). Brachiopods and Crinoids have also been observed in these beds. The following fossils were determined by Stubblefield and described by N. Tolun and Z. Ternek in their paper (1952) :

Paradoxides cf. *mediterraneus* Pomp.
Peranopsis sp,
Corinexochus sp.
Solenopleura? cf. *hispida* Thoral
Agraulos ceticephalus (Barrande)
Palaechinoid (Echinosistites?)

Based on this evidence, the lower part of the Koruk formation can be considered as Middle Cambrian in age. We assume, on the other hand, that the upper part of the formation includes the Upper Cambrian too. Then, the 250-300 m thick quartzites, the top sequence of the Koruk formation, have been conformably overlain by Ordovician black shales. These black shales, observable near the village of Sosink (Değirmenli) contain Trinucleus and Diplograptus.

II. CAMBRIAN OUTCROPS OF PENBEĞLİ - TUT REGION

The Cambrian rocks of this region are exposed in three places: the first, at the southern flank of Kaplandere valley, north of Penbeğli; the second, around the village of Meryemuşağı, 3 km west of Tut (Fig. 1); and the third where the oldest series of Cambrian sequences is disclosed, around the village of İnişdere 6 km ENE of Tut.

The four lithological units of the Cambrian can easily be observed at the first place, but only the two older units are exposed at the second outcrop near Meryemuşağı.

The four different units of the Cambrian observable in the Penbeğli-Tut region are :

a. Meryemuşağı formation (C_e)

The oldest series of Cambrian of this region crops out around the village of Meryemuşağı and İnişdere, and in the valley of Kaplandere, north of Penbeğli. The formation consists of the following sedimentary layers, from bottom to top :

— Monotonous dark shales ;
— Glauconite-bearing green sandstones, graywackes and coarse-grained elastics ;
— Intercalation of siltstones and shales in dark-green color;
— Purple to wine-red sandstones, graywackes, colored shales and siltstones;
— Diabase-sill in ophitic texture at the top (Fig. 2).

The visible thickness of the formation, along the valley of Kaplandere and west of Tut is 210 to 230 meters. Since the bottom of the formation is not exposed in this region, the entire thickness of it could not be measured.

The top level of the Meryemuşağı formation, the diabase - sill, has been conformably overlain by colored, coarse-grained sandstones and small-grained conglomerates which form the base sediments of the next Kaplandere formation (C_1).

No fossils have been found in this lowest part of the Cambrian series. However, according to the regional stratigraphic sequences, the Meryemuşağı formation corresponds to the Telbismi formation of Derik region (Plate I). Therefore, it can be considered to be of early Cambrian or Infra-Cambrian (Eo-Cambrian) age. These two formations, Telbismi and Meryemuşağı, have developed in different facies. The Telbismi mainly consists, as mentioned above, of volcanic materials, 2400 m thick; and the Meryemuşağı, on the contrary, is composed of sedimentary layers with a diabase-sill, 10 m thick, at the top.

These different facies of the rock sequences in the Derik and Penbeğli-Tut regions give us important data on the paleogeographic environment of Southeastern Turkey during early Cambrian times.

b. Kaplandere formation (C_1)

The clastic sediments exposed in Kaplandere valley, north of Penbeğli, form the second lithological unit of the Cambrian of this region, locally called the Kaplandere formation. It begins with thin-bedded quartzites and shales which are followed by reddish-violet-colored and cross-bedded, sometimes conglomeratic, sandstones and quartzites. The upper part of the formation is composed, on the other hand, of fine-grained, thin-bedded quartzitic sandstones topped by a 25 m thick diabase layer in ophitic texture (Fig. 2). This magmatic intercalation was not observed, however, at the outcrop near Tut. The Kaplandere formation is limited here by Jurassic and Cretaceous limestones by means of a fault.

The whole thickness of the formation along the Kaplandere valley reaches to 115 meters and in the outcrop west of Tut, to 175 meters.

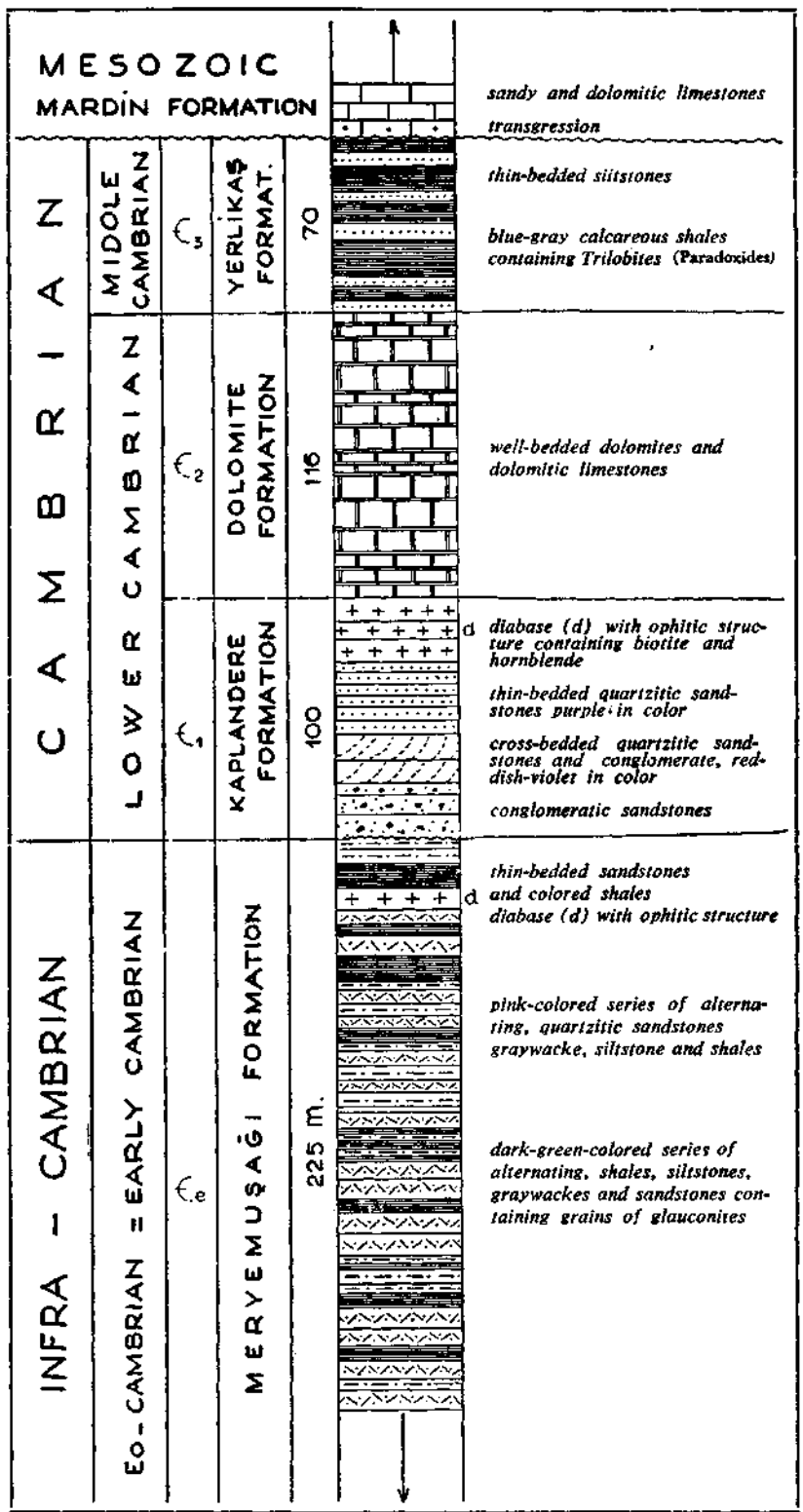


Fig. 2 - Stratigraphic column of Cambrian formations of the Penbeğli-Tut region.

No fossils have been found in this formation, but the stratigraphic position of it below the fossiliferous Middle Cambrian suggests a Lower Cambrian age corresponding to the Sadan formation near Derik and to the Dahu series of East Iran (Plate I).

c. Dolomite formation (C_2) of Penbeğli - Tut region

The third unit of the Cambrian sequences of Penbeğli-Tut region has developed as a carbonate series composed of dolomites and dolomitic limestones, 116 m thick. This carbonate series consists, on the other hand, of an intercalation of thin- and thick-bedded layers of dolomites and of dolomitic limestones, which form steep or gentle slopes on the southern flank of the Kaplandere valley (Fig. 2).

Like the previous formations, the dolomites do not contain fossil remains at all. They are mostly crystalline and compact in texture. The age of the formation, therefore, has been estimated, according to correlation and to stratigraphic position, as the upper part of Lower Cambrian (Plate I).

d. Yerlikaş formation (C_3) (Fossiliferous Middle Cambrian)

The upper part of the Cambrian series exposed in the Penbeğli - Tut region is composed of thin-bedded and gray-colored siltstones and shales which were unconformably overlain by Mardin limestones, Upper Jurassic - Lower Cretaceous in age (Fig. 4, P_2).

At the place, locally called «Yerlikaş», 2.5 km east of Penbeğli, the limy shale beds contain Trilobites, many examples of the genus *Paradoxides*.

The thickness of the Yerlikaş formation reaches to 70 m in the western part and increases to 270 meters in its eastern continuation.

According to the lithological development and to the stratigraphic position of the formation, it is possible to correlate it with the Koruk or Sosink formation of the Derik region, and, therefore, to place it as Middle Cambrian in age.

On the other hand, the Yerlikaş formation is much thinner than the Sosink of the Derik region. The upper part of the Yerlikaş formation, corresponding to the estimated Upper Cambrian of Derik region, has been covered by Cretaceous limestones north of Penbeğli (Fig. 2, and 4).

III. CAMBRIAN OF AMANOS MOUNTAINS

The Cambrian rocks exposed near Hassa and Saylak in the central part of the Amanos Mountain can be divided, like the other outcrops mentioned above, into four lithological units. They are:

a. Çamlıpınar formation (C_e)

A monotbnous series of alternating, well-bedded, phyllitic shales, siltstones, quartzitic sandstones and graywackes, greenish-gray in color, appear on the way from Hassa to Çardak Yayla, near the village of Saylak, in the middle part of the Amanos Mountain. They are locally called the Çamlıpınar formation. It is about 1500 to 2000 meters thick and forms a north-south-trending belt.

Since the base level or the bottom of the Çamlıpınar formation is not observable, it has not been possible to determine the actual thickness of the whole series. In addition to this, the formation consists of an overturned anticline which has been cut by normal faults at the east border.

The thickness of the outcropping sequence along the Çamlıpınar section is more than 2000 meters (Fig. 4, P_3).

The Çamlıpınar formation has been considersd by other geologists working in this area as Precambrian in age. They have assumed an angular disconformity between this formation and the overlying quartzite-arkose series. But, only a slight disconformity between these two series, as shown near Derik and in the Penbeğli-Tut region, were observed by the author. Therefore, a correlation between the Çamlıpınar formation and the Telbismi of Derik and the Meryemuşağı of Penbeğli-Tut are proposed. All three formations are considered to be Infra-Cambrian or Eo-Cambrian in age. They are also covered by the same stratigraphic unit, the colored sandstone-arkose-quartzite - series, of Lower Cambrian age (C_1).

Although only a slight disconformity exists between the Çamlıpınar and the following Çardak Yayla formation at the localities of Akboz Burnu and Kızıl Kaya, on the western margin of Çamlıpınar series, on the contrary, a clear angular disconformity can be observed between these two series at, the eastern border of the Çamlıpınar formation, where a great normal fault brought both formations to each other in unconformable position (Fig. 4, P_3).

No fossils were found in these early Cambrian sediments. But, it is believed that the fine-grained shales of this series may contain some organic fragments.

b. Çardak Yayla - Çalaktepe formation (C_1)

The second lithological unit of the Cambrian in the Hassa area commences with conglomeratic arkoses and quartzites, pinkish-violet in color, which overlie the shaly-phyllitic rocks of the Çamlıpınar formation by a slight disconformity. These clastic sediments include also well-bedded and different colored quartzites with some thin intercalation of ferruginous, micaceous shales exposed in Çalaktepe and around Çardak Yayla, on the road from Hassa to Dörtyol. The formation has an average thickness of 280 meters and some quartzite beds are 100 to 120 cm thick.

Although no fossils have been found in the whole series, it can be correlated with the Sadan formation of Derik and the Kaplandere formation of Penbeğli-Tut region, because of its stratigraphic position and lithological characteristics. Thus the Çalaktepe formation can also be assumed to be of Lower Cambrian age.

There is a gradual passage to the next series, the dolomite formation.

c. Dolomite formation (C_2) of Hassa region

Like the other Cambrian outcrops of Southeast Turkey, the dolomite formation in the Hassa region consists of dolomites and dolomitic limestones light-brown, blue-gray to black in color. The lower beds of the series were coarsely crystalline, dark, dolomitic limestone, in a ferruginous matrix.

The thickness of the formation is 100 to 150 meters, and the rocks are apparently unfossiliferous. The dolomite formation is followed conformably by a calcareous - shaly, but fossiliferous series, locally named the Tiyek formation (Fig. 4 and Plate I).

d. Tiyek formation (C_3) (Middle and Upper Cambrian)

This formation is exposed in and around the village of Tiyek, 2 km west of Hassa. The rock sequence starts with colored, thin-bedded, nodular limestones and calcareous shales, 10-15 m thick, containing Trilobite fragments. Good examples of Trilobites belonging to the genus *Pardailhania (Pardailhania* cf. *barthouxi* Mansuy) were found and collected, by R. Krummenacher «5 meters above the base of the formation, along the road climbing from Saylak, 12 km NW of Kırıkhan, to the Alan Plateau». Therefore, the age of the lower part of the Tiyek formation near Saylak has been placed after W. T. Dean and R. Krummenacher (1961) as Middle Cambrian, or more precisely, Lower Acadian.

These fossiliferous limestone sequences, locally called «passage beds», at the bottom of Tiyek formation are followed conformably by a monotonous shaly series consisting of calcareous shales, pure micaceous shales, siltstones and some fine-grained sandstones.

The top levels of the Tiyek formation are composed of alternated, well-bedded shales and white quartzites appearing on the higher peaks of Kabaktepe and Mastaftepe, northwest of Çardak Yayla.

The total thickness of the formation south of Tiyek is 700 to 750 m and near Saylak 250 meters.

The Tiyek formation of the Amanos Mountain corresponds to the Yerlikaş formation of Penbeğli-Tut and to the Sosink-Koruk formation of the Derik region (Plate I).

IV. CAMBRIAN OF EAST IRAN

The Cambrian rocks exposed between Kerman and Sagand in East Iran (Fig. 3) have been studied by R. Huckriede, M. Kürsten and H. Venzlaff, and published as an excellent memoir in 1962.

In order to make a comparison of the Cambrian formations of both countries, a short summary of the Cambrian of East Iran is included.

The Cambrian and Precambrian formations outcropping between Kerman and Sagand in East Iran consist of the following series:

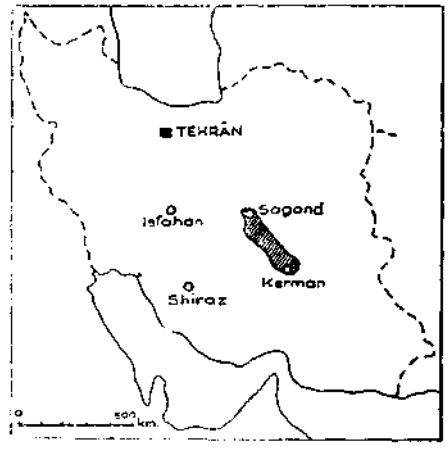


Fig. 3 - Index map showing the area between Sagand and Kerman in Iran, where Cambrian formations occur.

a. Morad series

The non-metamorphic clastic marine sediments, such as micaceous arkoses, quartzitic sandstones, slates and radiolarian cherts exposed on the Morad anticline, are supposed to be of Upper Algonkian age. Some organic fragments, algae and radiolarians, have been observed in thin sections of rock specimens. The thickneess of the outcropping succession is more than 500 meters. The sedimentary layers have been cut by volcanic dykes (Plate I).

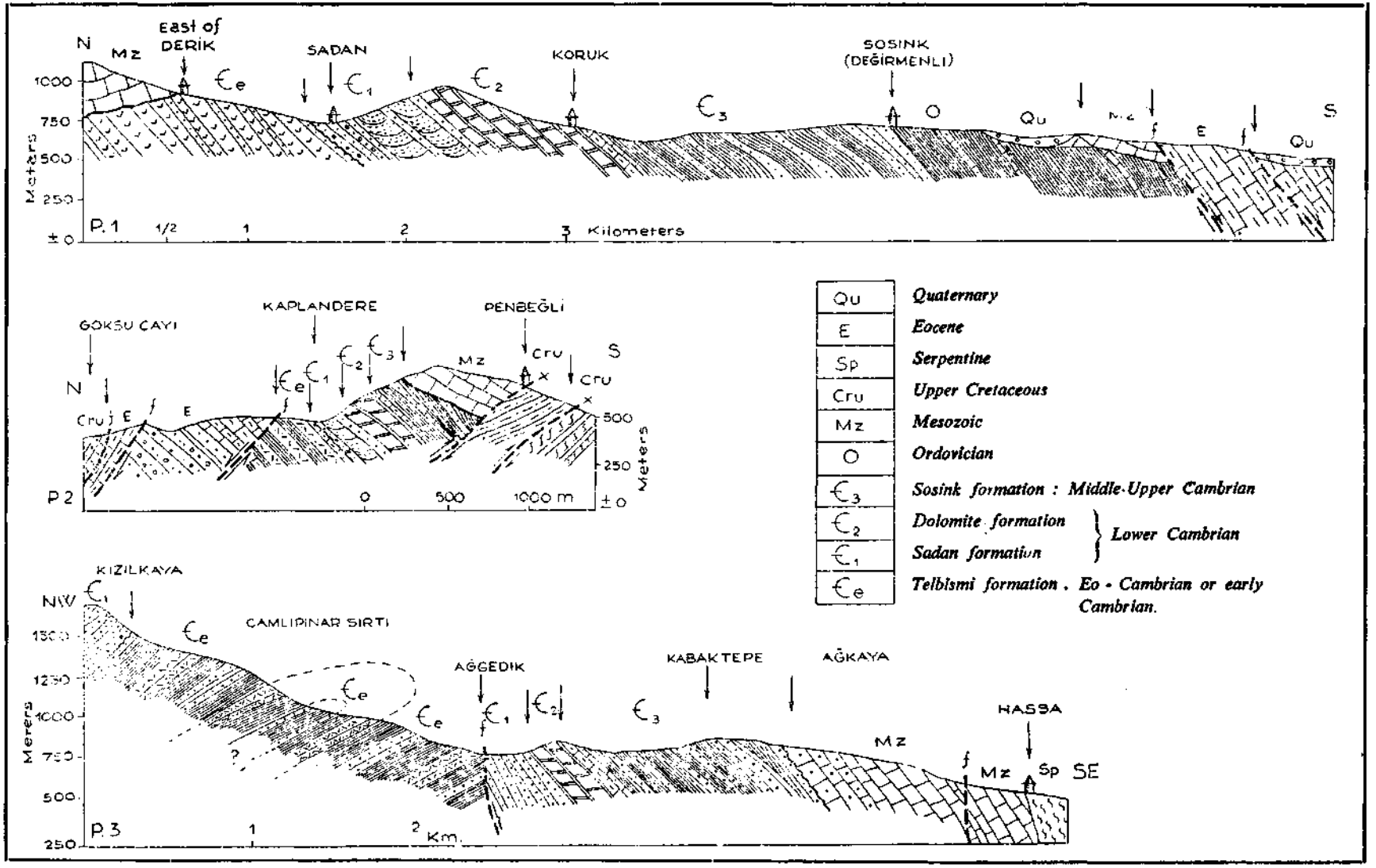


Fig. 4 - Geological cross-sections of the Cambrian formations in southeastern Turkey.
P. 1 - Derik region; P. 2 - Penbeğli-Tut region; P. 3 - Hassa region (Amanos Mountains).

b. Rizu series

The second unit, locally called Rizu series, consists of a thick succession of dolomites, quartzitic sandstones and acid volcanics. It unconformably overlies the Morad series with 12 m thick basal conglomerates, which are, on the other hand, followed by an intercalation of sandstones, dolomites and volcanic materials, 600 m thick. The uppermost part of the series is composed of reddish-brown quartz-porphyry, felsite-porphyry and other volcanic rocks, 150 to 200 meters thick.

The Rizu series has been estimated as early Cambrian in age.

c. Desu series

It consists of gypsum-dolomite series mixed with porphyritic and acid volcanics, including thin layers of reddish-colored sandstones. These rocks have been strongly deformed, brecciated, mylonitized and uplifted as diapiric folds.

The alternated gypsum and dolomite beds are followed by black limestones, colored sandstones, shales, quartzites and volcanic materials, such as, quartz-porphyry, augite-porphyry and tuffs. Some reddish-violet and fine-grained sandstones and siltstones also appear at the top of the formation.

The whole thickness of Desu series is about 300 to 400 meters.

The two series, Rizu and Desu, can be correlated with the Telbismi formation of the Derik region in Southeast Turkey. Therefore, it can be assumed also to be of Infra-Cambrian or early Cambrian age.

d. Dahu series

The Desu series has been conformably overlain by the Dahu series which is made up of colored and cross-bedded sandstones of Old Red type including some thin layers of quartzitic conglomerates, breccia and shales. The dotted sandstones contain grains of uranium and vanadium minerals. The thickness of the series varies from 400 to 1000 meters.

According to their lithological characteristics and stratigraphic position, the Dahu series corresponds to the Sadan formation of Southeast Turkey, and belongs, therefore, to the Lower Cambrian.

e. Fossiliferous serie (Uppermost Lower Cambrian to Middle Cambrian)

The colored sandstones of the Dahu series have been conformably overlain by a dolomite sequence more than 200 m thick. This is followed by a colored series composed of sandstones, quartzites, dolomitic sandstones and black Trilobite-limestones of the *Redlichia* - zone, 20 to 40 m thick. These fossiliferous limestone beds also contain Orthothecas which are characteristic of the lower part of Middle Cambrian.

f. Middle to Upper Cambrian

Southeast of Kerman, near Dorah Shad Dad, another limestone horizon, containing a Trilobite fauna of Upper Middle Cambrian or lowermost Upper Cambrian age, has been found by M. Kürsten. The Trilobite - limestones of both horizons are lithologically similar to each other, but contaifi different kinds of fauna. The upper zone contains the following fossil organisms:

Lioporella (L. walcotti Kobayashi)
Orthotheca cf. *kingi* R. G. Richter
Kobayashiella sp.
Obolacea and Lingulacea

«The sequence from the Upper Cambrian to the Devonian is of a relatively small thickness and consists of sandstones in Old Red facies, dolomites and occasional intercalation of calcareous rocks.» Ordovician starts with fossiliferous limestones (Orthidenkalk) containing Conodonts and Brachiopods; which are succeeded by Graptolite *(Didymograptus)* -bearing black shales.

V. COMPARISON OF THE CAMBRIAN FORMATIONS OF SOUTHEAST TURKEY AND EAST IRAN

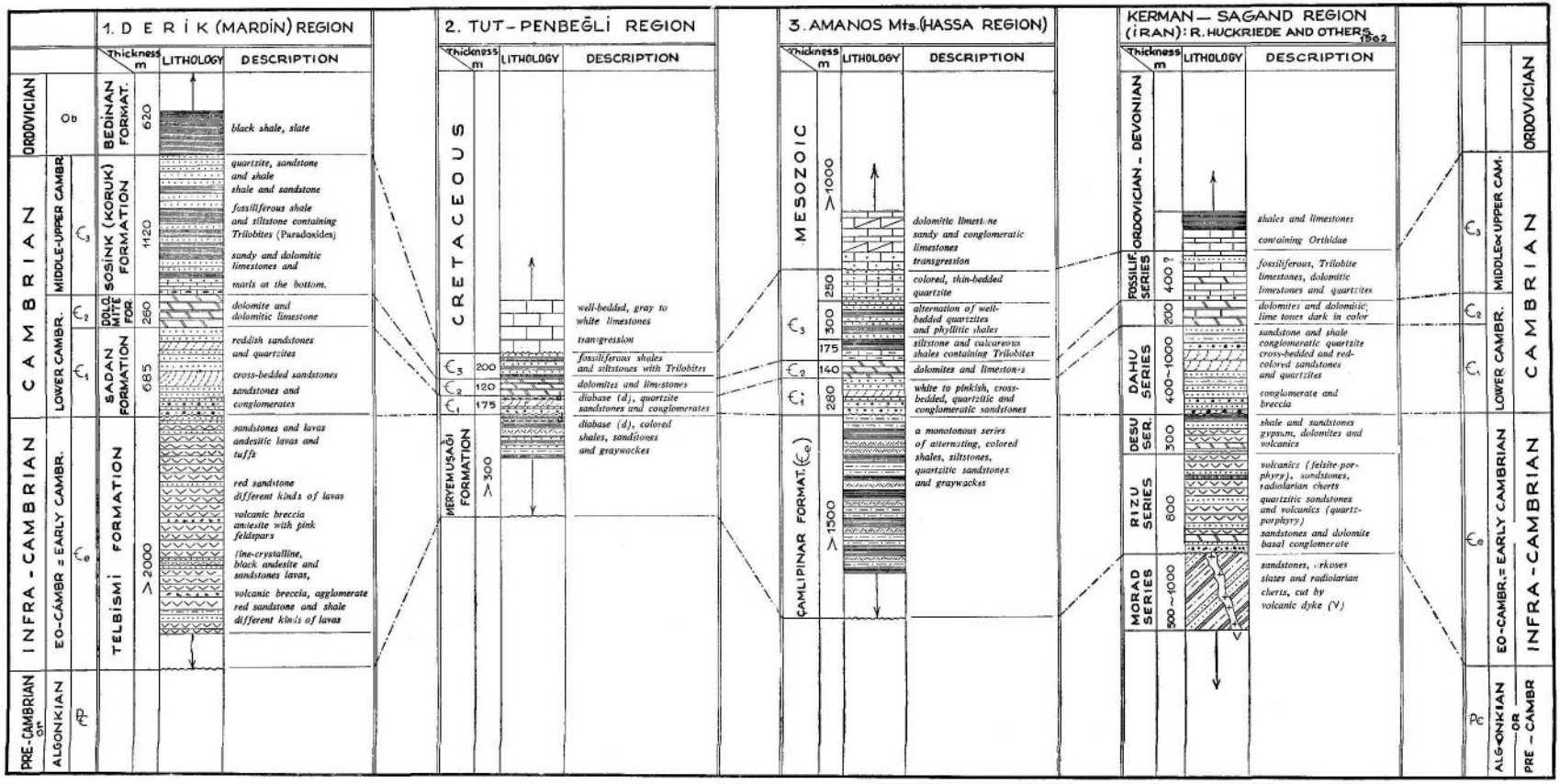
With regard to the lithological and paleontological aspects, the Cambrian outcrops of Derik, Penbeğli-Tut, and Amanos Mountain in Southeast Turkey are very similar to the Cambrian series between Kerman and Sagand in East Iran. The outlines of these similarities are clearly shown on the correlation chart, Plate I.

On this table the colored and mostly cross-bedded sandstone-quartzite series of Lower Cambrian age has been selected as the base for comparison. It is, indeed, the most common lithological unit under the entire Cambrian series, and represents the Sadan formation of Derik region, the Kaplandere formation of Penbeğli-Tut, the Cardak Yayla-Çalak Tepe formation of Amanos Mountain and the Dahu series of East Iran. The rock sequences below these reference layers correspond to the formations of Infra-Cambrian or early Cambrian age; the series above the base, on the other hand, iuclude the sedimentary succession of the Lower, Middle and Upper Cambrian.

Although the real Precambrian rocks are exposed below the early Cambrian series in Iran (Morad series) with an angular disconformity, there is lacking such a Precambrian outcrop and an angular disconformity in Southeast Turkey. The formations known as Telbismi, Meryemuşağı and Çamlıpınar outcrop below the Lower Cambrian sandstones and belong, therefore, to the early Cambrian or the Infra-Cambrian, not to the Precambrian. They have been assumed, however, to be of Precambrian age by some geologists.

It is worthwhile to mention that the volcanic Telbismi formation of the Derik region corresponds to other volcanic series, such as the Rizu and the Desu in Iran. The actual Precambrian rocks of East Iran appear below these sequences with volcanic intercalations. In Southeast Turkey, on the contrary, the Precambrian rocks are not yet exposed. The oldest or the lowest rock succession exposed in these regions belongs to the early Cambrian or the Infra-Cambrian.

The upper parts of Cambrian series, the dolomite formation and the fossiliferous limestones and shales of both countries were developed in a similar fashion. Only the thicknesses of the formations differ from one region to the other. In addition to this fact, the Upper Cambrian of Southeastern Turkey consists mainly of clastic sediments, such as, quartzites, sandstones and shales; but the corresponding formations of East Iran are more calcareous or dolomitic in composition (Plate I).



CORRELATION OF THE CAMBRIAN FORMATIONS IN SOUTHEASTERN TURKEY AND EAST IRAN.

Note

This manuscript was ready for publication when the author received the paper entitled «New Data on the Lower Paleozoic and pre-Cambrian of North Iran» by J. Stöcklin, A. Ruttner and M. Nabavi with contributions by M. Samimi, J. Eftekhar-Nejad, etc., published by Geological Survey of Iran (Report no. 1, 1964). For this reason it was not possible to include a correlation of the Cambrian formations of Southeast Turkey with the Cambrian of North Iran. A more detailed correlation to include this new material on the Taurus and Elburz Mountains is contemplated by the author for a future paper.

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