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Türkiyede "Pilov Lavlar"

W. J. McCALLIEN

Özet: Pilov lavlar Türkiyede jeologlar tarafından görülmüş olmakla beraber hakiki durumları umumiyetle lâyık olduğu veçhile takdir edilmemiştir. İlk defa 1945de Torosların şimal yamaçlarında Bereketli Maden civarında BLUMENTHAL tarafından Andesit diye vasıflandırılan sahreler arasında pilov lavları teşhis ettim. Bir kaç sene sonra buranın güney batısına düşen Ulukışla-Bor çevresinde karakterleri daha vazih görülen pilov lavlar müşahede ettim. Anadoludaki pilov lavların resmi ilk defa burada alınmıştır. Bu pilov lavlar dünyada bulunanların en güzellerindendir.

Pilov lavlarla yakından ilgileri olmıyanlar için bunlar hakkında biraz malûmat vermek faydalı olacaktır. Pilov lavlar terkip itibariyle umumiyetle <basık>> olup görünüş cihetinden bir yastık veya bir torbaya benzerler. Dışları cam gibi ince bir tabaka ile kaplı, bazan da hücreli olurlar. Kışrın sertleşmesi ya magmanın su ile veyahut sulu bir sediman ile teması neticesidir. Pilovlar hücreli oldukları vakit bu hücreler <konsantrik> bir surette dizilirler. Pilovların zarlarının mevcut hacma kendilerini uydurabilecek yumuşaklıkta olmaları gerekir. Pilovların aralarındaki boşluklar umumiyetle kalker ve radiolaritle dolmuş bulunur.

Pilovların bizzat teşekkülleri Dr. Tempest ANDERSON tarafından Samoa adasında Matavani volkanı civarında lavların denize aktığı yerde görülmüştür. Lavlar denize vardıkları vakit lav parçaları ince boyunlu beyzî bir şişe şeklini aldıktan sonra bir torba hacmine kadar büyüdükleri müşahede edilmiştir.

Türkiyede pilov lavlar (a) Üst Paleozoik veya Trias, (b) Mesozoik, (c) Eosen devirlerine aittir. Birinci kategorideki eski lavlar Ankara dolaylarında grovak, kalker, tüf ve bazik bürkanî taşlarla birlikte görülürler. Mesozoik pilov lavlar Anadoluda geniş bir surette inkişaf eder ve genel olarak ofiolitik yeşil sahrelerle birlikte rastlanırlar. Kalecikle Elmadağ arası iyi bir mis-

al olarak verilebilir. Tersiyere ait Pilov Lavlar Torosların şimal versanında bilhassa Ulukışla-Bor civarında pek güzel görülürler. BLUMENTHAL'in andezit diye gösterdiği bu sahrelerin yerini tren hattından ötede Eosen flişi almaktadır. Etüt edilen pilov lavlar bu fliş içinde aratabakalar şeklinde tezahür eder. Burada Eosen'in şiddetle iltivalı olması enteresan bir olay olarak not edilebilir. Türkiyedeki Pilov Lavlar'ın şekilleri sunduğum krokilerle gösterilmiştir. Bunlarda hücreler kışra muvazi olarak yahut aşağıdan yukarıya ince bir boru gibi tekevvün ederler. İskoçyada Mull adasındaki pilov lavlar Türkiyedekilere çok benzerler. Oradaki Pilovların büyüklüğü 60 - 120 santim arasında değişir. Mull'da volkan gölünün etrafında su altında değil de havada teşekkül etmiş karasal pilov lavlara yakın şekiller müşahade edilir.

Some Turkish Pillow Lavas

W. J. McCALLIEN

Summary: *In the following notes attention is drawn to the existence of pillow lavas of various ages in many parts of Anatolia. Special notice is taken of the two different types of pillows shown by the lavas in the neighbourhood of Ankara and Ulukışla. The illustrations are from these regions.*

The objects of the present note are mainly to put on record the great distribution, both in time and space, of pillow lavas in Anatolia and to illustrate some of the most typical occurrences. The writer, naturally, has not been able to see anything like all the occurrences. This would be impossible for any one geologist, but he has seen sufficient to illustrate the main structural characteristics of the Turkish pillow lavas, and later it is hoped to be able to continue the study both in the field and in the laboratory. In some cases only rushed visits have been paid to the lavas from some locality which the writer was visiting for some other purpose. In other cases, the pillows have been seen from the train and the localities noted for future visits when time permits.

So far as the writer is aware the name pillow lava has not been used previously for the occurrences referred to here. Geologists must be familiar with many of these occurrences, but in most cases their true nature has not been appreciated. Blumenthal has mapped large areas of spilites in many regions and is familiar with the pillow lavas on the northern flanks of the Taurus Mountains which are illustrated here. It was among the rocks mapped as andesite by this geologist that the present writer first recognised pillow lavas in 1945 in the Bereketli Maden district. The exposures are good but the pillow structures are difficult to see or illustrate. Some years later, however, the most remarkable sections of excellent pillows were found in the same rocks further to the south- west in the Ulukışla-Bor region. This discovery leaves no doubt about the accuracy of the original identification of the Maden region.

This is the first occasion on which pillow lavas from Anatolia have been illustrated although they are among the finest in the world. The writer hopes to see more of the occurrences in the future and to make more ad-

equate illustrations of the details, which have been missed in his hurried examinations. It is thought best to publish the existing illustration now because opportunities to visit many of the out of the way occurrences are not frequent.

For the benefit of those who are unfamiliar with pillow lavas, and who may have opportunities of finding new occurrences, the writer gives a brief historical summary of what is known about their structures. The main sources of our information are Tyrrell's The Principles af Petrolog the same author's Volcanoes and Cotton's Volcanoes as Landseape Forms, three books which are available to me here. Then in describing the Turkish lavas we shall refer to Scottish examples which have been described in great detail and illustrated in the Memoir of the Geological Survey of Scotland entiteled The Tertiary and Post-Tertiary Geology of Mull etc., by C. T. Clough, E. B. Bailey, and others.

Pillow-lavas, which are mainly basic in composition, have the appearence of being composed of piles of small isolated masses, variously compared to pillows, sacks, and cushions. According to Tyrrell, the pillows generally have a vesicular crust and occasionally also a glassy skin. The solidification of the skin is usually attributed to rapid chilling with water or water-rich sediments. When it was first formed the skin must have been soft, but tough enough to allow continued growth of the pillow and thus allow it to adopt the shape of the space into which it inade its way. The internal structure of the pillows is highly characteristic. For example, when vesicules are present they tend to be arranged in concentric zones. The spaces between the pilows are often filled with limestone and radiolarian chert.

The actual formation of pillow lavas was witnessed by Dr. Tempest, Anderson where the lava from Matavanu volcano, in Samoa, ran into the sea. When the lava reached the sea ovoid masses of the lava could be seen to swell and crack into a sort of bulb with a narrow neck, and the bulb would increase until it became the size of a sack. The neeks connecting pillows were generally short, so that the newly-formed masses were heaped together.

Ancient pillow lavas occur in many parts of the world. In Britain some of the finest examples occur in Scotland and those of Dalradian age in the Tayvallich peninsula of Argyll have been illustrated in many textbooks. The

present writer, for example, made a black and white sketch (Fig. 103) for the textbook <<Introduction to Geology>> by Bailey, Weir and McCallien. There the structures, and particularly the concentric zones of vesicules, are particularly striking. Other Scottish pillow lavas are of Arenig age and of Tertiary age. The latter are of special interest to us here because these structures are almost identical with those of Turkish lavas from the Taurus region. The Scottish pillow lavas referred to were formed in a crater lake on the island of Mull.

In Turkey the pillow lavas which the writer has been able to examine are of three ages: a) ? Upper Palaeozoic or Trias; b) Mesozoic; and c) Eocene. The lirst group occurs in the Ankara district in association with greywackes, limestones, tuffs, and ultrabasic igneous rocks. The occurrence is new to Turkish geology and the writer hopes to publish a more detailed study of the problems involved in a later work. At present the actuel age of the lavas is unknown but they are provisionally grouped as doubtful upper Palaeozoic although future research imay show that they are later. The age of the associated limestones is difficult to determine with the facilities at his disposal, but ihe writer hopesthat thestudy of theirstructural relations and the possibilty of finding fossils in future studies may throw light on the problem. The structural problems involed are of a complex character and much further field work is necessarry before they can be solved. It is because of their apparent intimate association with the greywackes that a doubtful upper Palaeozoic age is at present assigned to them. In addition to those which are illustrated here from Ankara there are also pillow lavas in a group of rocks which have been mapped by Oğuz Erol and myself under the name Kayaş Volcanic Series. Chaput has already claimed a Triassic age for these rocks.

The Mesozoic pillow lavas are widespread and associated with the great belts of green rocks, cherts, limestones, etc. which are conspicuous features of the geology of Anatolia in many regions. For example they are beautifully exposed in places between ElmaDağ and Kalecik to mention but one locality near Ankara. Following previous geologists a Mesozoic age is accepted for these.

It may be pointed out that various ages have been assigned to the ophiolites. For example, according to Egeran some of them may have been

formed during the Hercynian movements, others during the Jurassic and still others durring the upper Cretaceous. Blumenthal has studied the Mixed Series in many parts. In the Bolu region he thinks that they are of Senonian age on the basis of the foraminifera found in the associated many limestones. In other parts, however, he says that they may be of Triassic age. A Triassic age would probably apply to the Mixed Series to the north-west of Ankara. There the green rocks, according to Blumenthal, underlie the Lias.

The tertiary pillow lavas are best displayed on the northern side of the Taurus and especially in the Ulukışla - Bor region on Blumenthars map[1]. Of the Niğde-Taurus region there is a great lenticular belt of andesites stretching from near Payandere to Ulukışla, a distance of about 75 kms. from north - east to south- west and more than 20 kms. across from north - west to south - east. To the north-west of these andesites the Eocene flysch forms an irregular outcrop resting on the metamorphic rock of the Niğde complex and passing under Neogene in the south - western part of the district. Southward the Eocene passes into the Senonian of the Çiftehan zone. The age of the flysch is known from its nummulite content and apparently the andesites are interbedded in both the Eocene and Senonian. Blumenthal thinks that some of the andesites are intrusive and those which are described here as pillow lavas are shown on Blumenthal's section as intrusive into bot.h the Eocene and underlying Niğde Complex. Where the present writer has seen the rocks in the field (Bereketli-Maden: Yalatan: on the road from Bor to Ulukışla: and on the railway line near Ulukışla) lavas are the predominant types and pillow lavas are particularly abundant.

The illustrations accompanying this note are from the Ulukış- la region but they are typical of the Eocene volcanic episode. The <<andesite>> outcrop as drawn by Blumenthal stops at the railway line and the <<andesites>> are shown giving way to Eocene flysch from Ulukışla northward to Güney and beyond. The pillow lavas which the writer has studied on the railway line are interbedded in the flysch and pass west-

(1) M. Blumenthal, 1941. Un Aperçu de la Géologie du Taurus dans les Viyalets de Niğde et d'Adana. (M.T.A. Yayınlarından, Ankara.)

ward with the flysch and so under the Neogene of Central Anatolia. It is interesting also to note that the Eocene is highly folded.

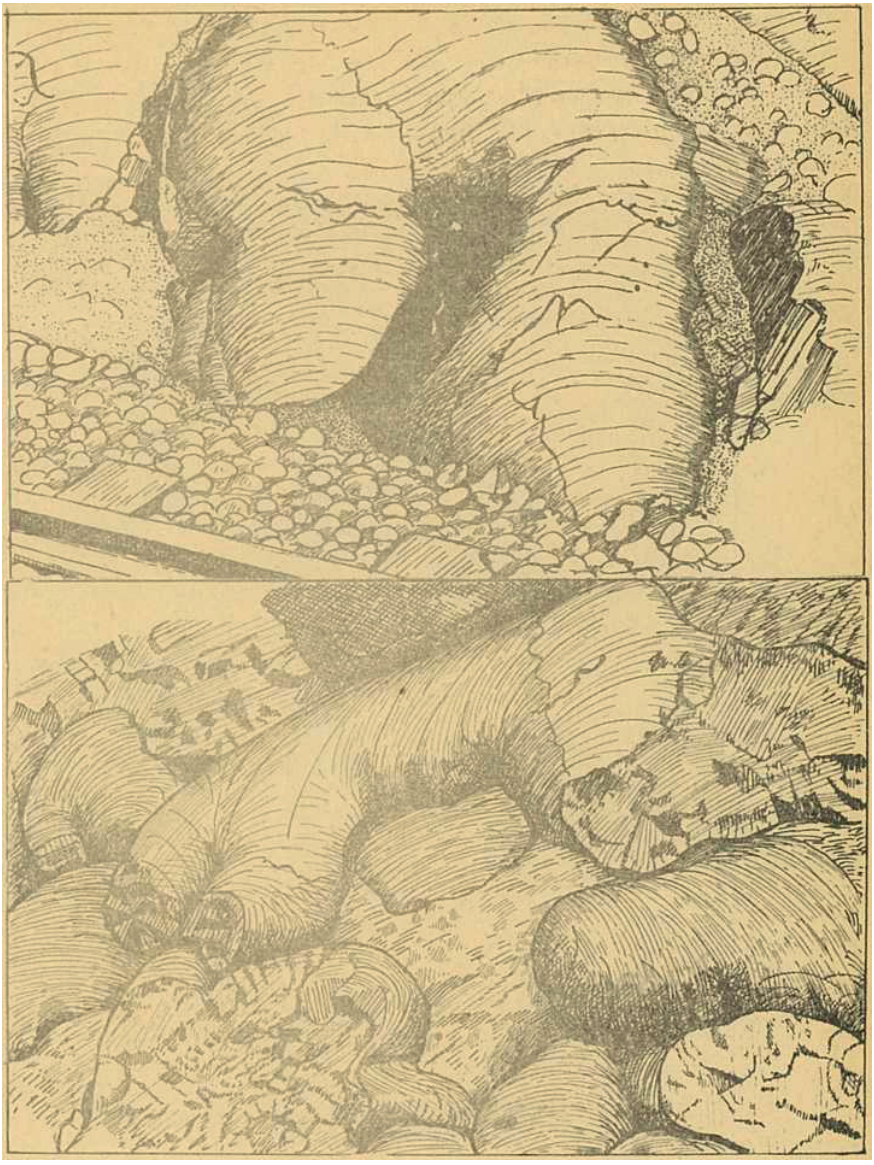
The structures of the Turkish pillow lavas are well illustrated on the accompanying illustrations. Regarding the arrangement of the vesicles it will be noted that there are two distinct types of lavas: a) those in which the vesicles are rounded or oval in shape and arranged parallel to the chilled margins of the pillows and b) those in which pipe-amygdales rise from fhe bottom and lower half of each pillow and give place in the upper part to rounded and oval amygdales.

The island of Mull, Scotland, is another district where such pillows as in b) above are well seen and have been well described. Comparison between the two regions is interesting and profitable. The Mull occurrences have been described in great detail in the Mull Memoir of the Geological Survey of Scotland referred to in the introduction. The authors of the memoir point out firstly that pillow lavas and pillow structures are generally accepted as being confined to lavas poured out into water. The surfaces of the indi- vidual lavas are superficially chilled, and as this must have been caused by a fluid, water is the only agent available since air is hardly adequate to chill red hot pillows. In Mull the individual pillows vary in size from about 2 feet to 4feet and often they are characterised by concentric zones of amygdales. One lava flow, 30 feet thick, consists of pillows with tuff between the pillow and <<from the base of each pillow spring pipe-amygdales while small round amygdales in concentric zones occur at the sides and mar-gins of the same>>. The resemblance to the Mull pillows is obviously striking and the present writer has shown the photographs of the Ulukışla lavas to Sir Edward Bailey who was largely responsible for the Mull Memoir and he was impressed both by the beauty of the Turkish lavas and by their resemblance to those of Mull.

In Mull an approach to pillow structure was seen in some lavas outside the Caldera lake region. The lavas are composed of large lenticles indicating flow structure and the lenticles often have pipe amygdales rising from the base of each flow band.

Above this there is a middle zone free of amygdales, and then an upper zone with normal, more or less rounded or spherical amygdales. In one lava

there may be half a dozen such flow bands on top of one another. Such lavas are interpreted as the subaerial counterparts of pillow lavas due to intermittent advance of a lava.

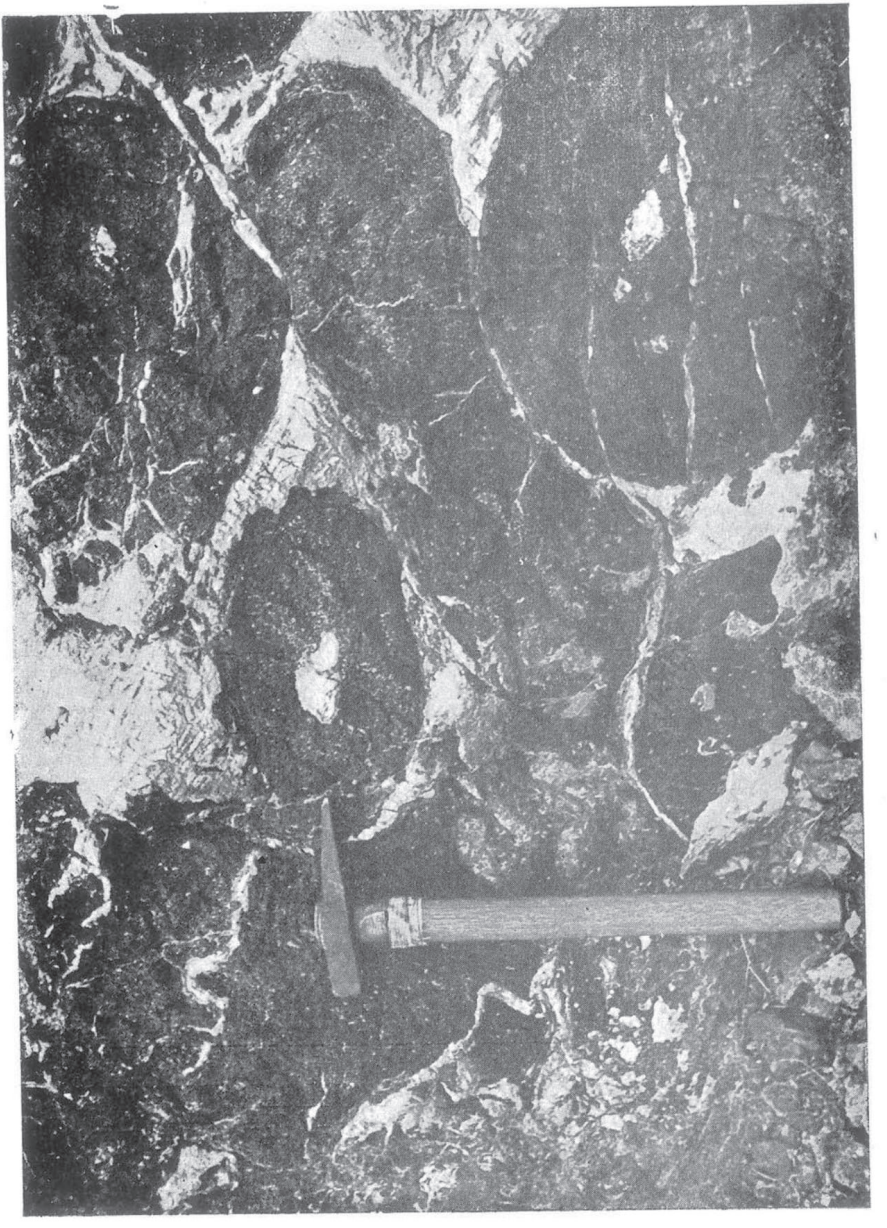


Şek. 1. Tomurcuklu Pilov Lavlar, Ulukışla

Fig. 1. Budding Pillows, Ulukışla.

Şek. 2. Tomurcuklu Pilov Lavlar, Ulukışla
Fig. 2. Budding Pillows, Ulukışla.

Levha I. Pilov Lavlar, Ankara.
Plate I. Pillow Lavas, Ankara.



Levha II. Pilov Lavlar, Ankara.
Plate II Pillow Lavas, Ankara.

Levha III. Pilov Lavlar, Ankara.
Plate III. Pillow Lavas, Ankara.

Levha IV Pilov Lavlar, Ankara.
Plate IV Pillow Lavas, Ankara.

Levha V. Pilov Lavlar, Ulukışla.
Plate V. Pillow Lavas, Ulukısla.