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FORMATION IN MARINE CONDITIONS OF THE OPHIOLITE OLISTOSTROME OF THE BAZUM SECTOR OF THE PLANETARY ANATOLIAN-SOUTH CAUCASUS OPHIOLITE BELT IN NORTHERN ARMENIA

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Abstract*. The ophiolites of the Bazum horst are represented only by an olistostrome mixt, the matrix of which is composed of a flyschoid sequence of rhythmic alternation of black mudstones, siltstones and Urasar sandstones. The ratio of olistoliths to the matrix indicates a synsedimentary mode of formation. In contrast to the Sevan-Akera part of the belt, the ophiolites of the Bazum horst do not have serpentinite melange. These features indicate the formation of the olistostrome in marine conditions, during obduction within the sea basin adjacent to the collision suture. The Dzoraget memamorphic complex of garnet-quartz-bimica crystalline schists and garnet amphibolites is the result of heating at the base of an obducted peridotite sheet.*

Keywords*: geology, ophiolites, olistostrome matrix.*

The purpose of the work is to identify the structural features of two ophiolite bands that were identified during field mapping by the author and previous researchers and their substantiation by analytical methods. The objectives boil down to substantiating the nature of the ophiolite olistostrome matrix and elucidating the reason for the accumulation of olistoliths exclusively within the black mudstone sequence of the Urasar Formation.

Ophiolites of the Bazum horst were studied by I.V. Barkanov [6], V.T. Akopyan [4,5], S.A. Palanjyan [9], Agamalyan [1,2,3]. On his map, I.V. Barkanov fantastically attributed two extended synclinal folds of the flyschoid strata of the current Urasar formation with inclusions of near-latitudinal ophiolite olistoliths up to 20 km long to dykes of ultrabasic composition. The contours of these dikes correspond exactly to the contours of two synclines of the Urasar Formation, shown on our map (Fig. 2). The mixing of dark gray and black mudstones of the Urasar formation of the lower Senonian with ophiolite olistoliths of the same black color enclosed in them continues to this day - for 90 years. A.L. Kniper and S.D. Sokolov [8] highlight in the Sevan-Akera zone the presence of a strata of rhythmic alternation of dark gray, black mudstones, siltstones and sandstones, completely identical to the sediments of the Urasar formation, called the flyschoid sequence, which they noted in many points of ophiolites of the Sevan-Akeri zone. They determined the age of the flyschoid cement strata as Lower Coniacian, similar to the Urasar formation identified by V. T. Akopyan [4] .These authors considered the flyschoid sequence of black mudstones as the “autochthonous base of ophiolites.” I identify the flyschoid sequence identified by A.L. Kniper and S.D. Sokolov with the Urasar formation of the Bazum horst. My opinion about the flyschoid strata essentially coincides with the opinion of A.L. Kniper and S.D. Sokolov, considering that this is an autochthonous foundation where fragments of the oceanic crust fell during obduction. We have a significant addition to the opinion of A.L. Kniper and S.D. Sokolov that this base, represented by the flyschoid strata, was in the state of unlithified liquid bottom silt at the moment solid fragments of the oceanic crust entered them About the liquid, unlithified state flyschoid strata, when fragments of the oceanic crust fall into it, are also evidenced by the words of A.L. Kniper [7] that “ With a more careful study ... in the cement of the olistostrome formation it is always possible to observe sorted layering and traces of sedimentation flow of sediments” , this is actually consistent with my opinion about the unconsolidated state of the matrix in the form of bottom silt of the sea basin .

At the base of the autochthon of the Bazum horst lies the Katnakhbyur suite of yellowish recrystallized limestones with a poorly preserved belemnite fauna, indicating an Upper Jurassic age. Stratigraphically higher lies the Spitak Formation of Aptian age [5] , represented by platy grayish limestones, composing an anticlinal uplift of latitudinal strike, separating two latitudinal synclines of the Urasar Formation.

on the southern slope of Karachan (2318.3) (left slope of the Zheltaya River) In the clayey limestones of the Chakh-Chakh formation, V. T. Akopyan found a shark tooth - Strophodus sp . (definition by L. Glinkman), indicating Albian age.

In the core of the Chakh-Chakh syncline there is a coaxial syncline of the Urasar suite, made black mudstones of the Urasar Formation with ophiolite olistoliths. It is composed of dark gray and black mudstones, siltstones and brown sandstones. The Urasar Formation includes ophiolite olistoliths. The latter are contained only in the flyschoid sequence of the Lower Coniacian Urasar Formation. This formation forms two subparallel near-latitudinal cavities. The northern or Dzoraget strip of ophiolites is localized along the bed of the Dzoraget River, also in a synclinal fold of near-latitudinal strike, which extends from the northern slope of Urasar to the east for 20 km to the border of the region. V. T. Akopyan [4] attributed this northern syncline of the flyschoid strata to the Archidzor Formation of Lower Cretaceous age. I assign the sequence of the northern syncline of black mudstones, including ophiolite olistoliths, to the Lower Coniacian Urasar Formation, due to their complete identity. The northern syncline, along with ophiolite olistoliths, also contains a large plate of apoperidotite serpentinites of the Dzoraget massif . This plate forms a nappe measuring 1900 m x 800 m, as a remnant of a larger partially eroded and eroded peridotite sheet obducted onto the terrigenous rocks of the Urasar Formation. The Dzoraget massif of serpentinites is surrounded from the west and south by a wide field of crystalline schists of garnet-quartz-two-mica composition and garnet amphibolites. These metamorphic schists also continue uninterruptedly under the base of the serpentinite plate of the Dzoraget massif. Metamorphic rocks form the Dzoraget massif, known since the last century. Previous researchers attributed this massif of metamorphic rocks to the outcropping of the Precambrian crystalline basement of the Lower Paleozoic. Only V.T. Akopyan [4] vigilantly saw the gradual transition of the internal structures of terrigenous rocks of the Urasar formation into crystalline schists, thereby excluding the Dzoraget metamorphic massif from the number of protrusions of the crystalline basement. The continuation of metamorphic rocks under the base of the peridotite plate indicates that the metamorphic rocks were formed as a result of heating under the hot base of the obducted peridotite plate onto the terrigenous rocks of the Urasar Formation. Such metamorphism was described by R. Coleman in the Franciscan Formation, where they were called “halos.” We propose the name “obduction metamorphism” for such metamorphism. V. T. Akopyan [4], when describing the layer-by-layer section of the Urasar Formation, presented the constituent rocks as a rhythmically layered

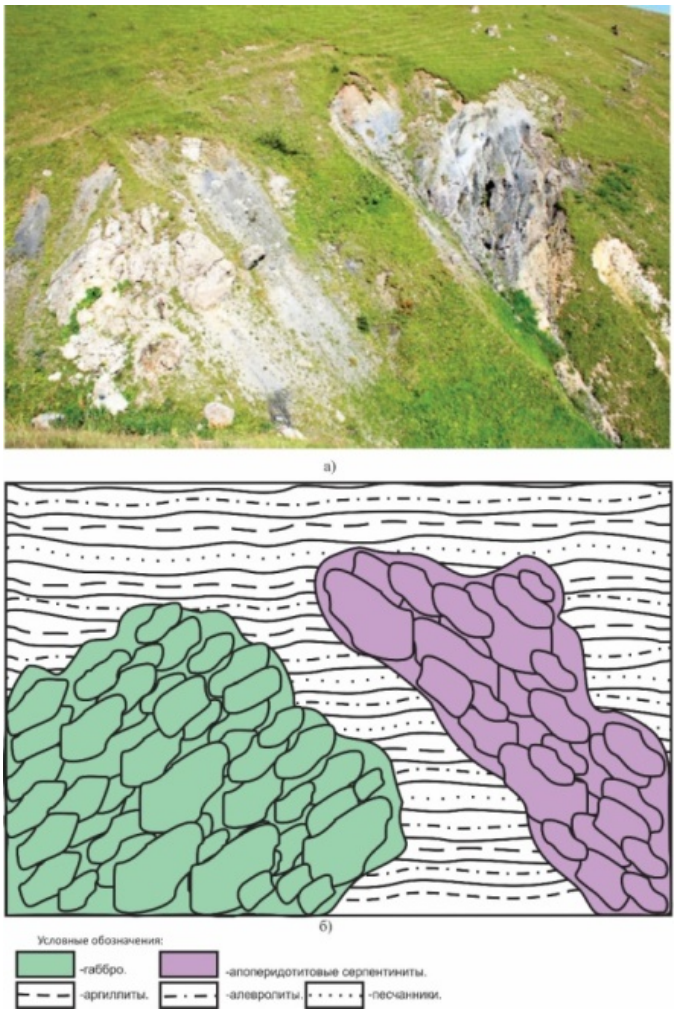

Fig. 1. Outcrops of two heaps of ophiolite fragments within the layered sequence of the Urasar Formation. 1a- Photograph of the outcrop, 1b- Lithological interpretation.

alternation of dark gray - black mudstones, siltstones with inclusions of ophiolites. He considered ophiolites to be cutting intrusions of basic and ultrabasic rocks of Paleogene age.

The right heap, 21 m high, consists of fragmented clasts and a serpetinite megaclast, while the left heap is an accumulation of shear clasts and gabbro megaclasts. When looking at the photograph of the outcrop and its interpretation in Fig. 1b, it seems that these fragments of oceanic crust were overloaded by huge trucks and dumped into the adjacent continental sea basin and, under their weight, sank into the bottom silt and sank to the base of this basin. forming an olistostrome after lithification.

About the difference between olistostrome and ophiolitic melange, A.L. Kniper [7] writes: “On closer study, the difference between it (olistostrome formation) and the melange of the Sevan-Akerin zone becomes quite obvious. The melange cement is serpentinite, the olistostrome complex is terrigenous, the melange cement is unusually strongly tectonized, and in the cement of the olistostrome formation it is always possible to observe sorted layering and traces of sedimentation flow of sediments.

It seems to me that the opinion of some previous researchers that the Bazum ophiolites belong to an ophiolite mélange [9] or an ultramafic dike [6] is a misconception caused by the great external similarity of the black, dark gray mudstones of the olistostrome matrix with the olistoliths of the ophiolites due to their similar color . The lack of thin sections and chemical analyzes of the matrix from the opponents also played a decisive role. We were the first to study thin sections and chemical analyzes of the matrix of ophiolites of the Bazum horst. They showed that the MgO content in the matrix varies within 2-3 percent, typical of terrigenous clayey-sandy deposits. Whereas the MgO content in serpentenites is ten times higher and amounts to 36 percent. The time of ocean closure, obduction and collision is determined by the Lower Coniacian age of faunal remains discovered by V. T. Akopyan [4,5] in sedimentary rocks of the Urasar Formation: E chinocorys gravesi (Desor) Lamb .,Plagioptychus sevanensis Remg., Radiolites lloprovincialis Math.

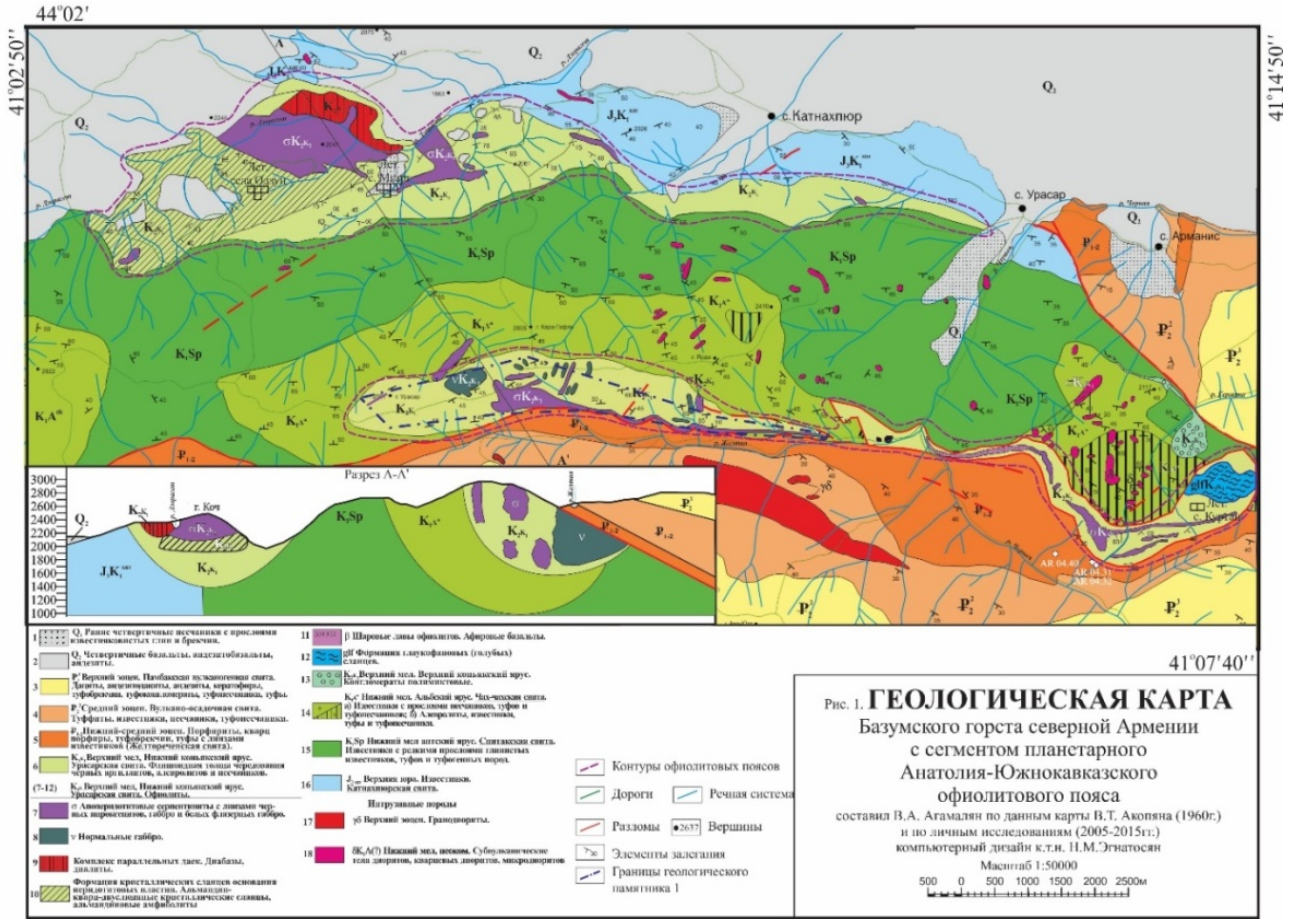

Fig. 2. Geological map of the Bazum horst of Northern Armenia.

References

[1] Agamalyan V.A. Ancient metamorphic complexes of the territory of the Armenian SSR and their tectonic position. // Materials of the II regional petrographic meeting on the Caucasus, Crimea and Carpathians. Tbilisi : Publishing house _ KIMS, 1978, s. 109-115

[2] Aghamalyan, V.A. The Lesser Caucasus earth crust formation and evolution in the collision zone of Paleo-Tethys // 5th International Symposium on Eastern Mediterranean Geology, Proceedings 1, Thessaloniki, Greece.,2004, p. 17-20

[3] Aghamalyan V.A. Formation of glaucophane schists. // Igneous and metamorphic formations of the Armenian SSR. Yerevan: Publishing House of the Academy of Sciences of the Arm SSR, 1981, pp. 121-122

[4] Akopyan V.T. Stratigraphy of Cretaceous deposits of the northern slope of the western part of the Bazumsky ridge. // Funds of the IGN of the Academy of Sciences of the Armenian SSR, 1961, 127 p.

[5] Akopyan V. T. On the stratigraphy of Cretaceous deposits of the Bazum Range (Northern Armenia) // News of the Academy of Sciences of the ArmSSR. Ser.geol.i geogr.nauk, vol. 15, no. 1, 1962, pp. 33-45

[6] Barkanov I.V. Geological sketch of the southern part of the Stepanavan region of the SSR of Armenia. // Yerevan, Funds of the Geology Department of Armenia, 1937, 106 p.

[7] Knipper A. L. History of the development of the Maly serpentinite mélange Caucasus. // Geotectonics, No. 6, 1971, pp. 87-100

[8] Knipper A.L., Sokolov S.D. Ophiolites of Vedi (Armenia): autochthon or allochthon? // Geotectonics, No. 4, 1976, p. 54-66.

[9] Palanjyan S. A. On the geological position of the ophiolites of the Bazum horst. // News of the Academy of Sciences of the ArmSSR. Geosciences, vol. 28, no. 5, 1975, pp. 14-27.

[10] Sokolov S.D. Olistostrome strata and ophiolite covers of the Lesser Caucasus. // Moscow: Science, 1977, 92 p.