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VLADIMIR NIKOLAEVICH SEMENENKO*

PROBLEMS OF THE PLIOCENE CORRELATION OF EAST PARATETHYS AND TETHYS

(*Tab. 1*)

Abstract: The contribution deals with the correlation of Pliocene of the Pontian-Caspian and Mediterranean regions, with regard to the determination of the boundary between Pliocene and Miocene. The basis of Pontian is set to 6.5 m.y., the basis of Kimmerian at 5.8 m.y. and the basin of Apsheronian at 1.8—1.9 m.y. The presented paper is based on paleomagnetic data, nannoplankton and on a comparison with works of authors dealing with the Mediterranean region. The basis of Kimmerian is compared approximately to Zanclean, the basis of Pleistocene corresponds approx. to Apsheronian.

Резюме: В статье расматривается корреляция плиоцена Понтическо-Каспийской области, с целью определить границу между плиоценом и миоценом. Нижняя граница понта определена на 6,5 м. л., киммерия на 5,8 м. л. и апшерона на 1,8—1,9 м. л. Предлагаемая статья исходит из палеомагнитных данных нанопланктона и из сравнения с работами авторов занимавшийся Средеземноморьем. Нижняя граница киммерия сравнивается приблизительно с основанием занклея и нижняя граница плейстоцена отвечает приблизительно апшерону.

Progress in the direct correlation of the Upper Miocene and Pliocene was obtained during the work of project No. 25 IGCP, when we had performed unexpected discovery — nannoplankton was found in Upper Miocene and mainly brakish Pliocene sediments of East Paratethys that according to previous opinions were formed isolately from oceanic ones (Semenenko — Lulyeva, 1978, 1982) that let us firstly make direct correlation of these deposits with Tethys region.

Complex of paleomagnetic researches was conducted at the same time (Semenenko — Pevzner, 1979) in the type area of East Paratethys— Kerch—Taman region, where practically all Late Cenozoic taxa of East Paratethys were distinguished. Combination of the discovered nannoplankton data — "dating of the levels" with the paleomagnetic dates, has allowed, sufficiently reliably calibrate researched series of sediments using paleomagnetic scale.

Deposits of the Meotian stage in its lower part has inverse magnetization and in its upper part — direct one.

In the lower part of the Meotian the nannoplankton of the Zone NN9 (*Discoaster hamatus*) was discovered and in the upper part of Meotian nannoplankton of the Zone NN10 (*Discoaster neohamatus, D. neorectus, Mynilitha convallis*). Lower part of the Meotian is correlated with the paleomagnetic Epoch 8 and upper part — with the Epoch 7. Lower Meotian boundary has

* Dr. V. N. Semenenko, Geological Institute of the Ukrainian Academy of Sciences, Chkalova 55b, 252054 Kiev-54.

K-Ar dating (G a b u n i a — R u b e i n s h t e i n, 1977) about 10.5 ± 1.5 m.y. that has not contradict to paleomagnetic interpretation (about 9 m.y.).

Whole Pontian (excluding its lowermost part) has inverse magnetization and refers to the paleomagnetic Epoch 6, that is Pontain deposits were formed in very short time interval about 0.7 m.y. (from 6.5 to 5.8 m.y.). Pontian nannoplankton assemblage is rather poor. There are no any zonal species. Overlying deposits of the Lower Kimmerian contain the nannoplankton assemblage with zonal species *Discoaster quinqueramus* (NN11), *Ceratolithus tricorniculatus* (NN12) et *C. acutus*. The Lower Kimmerian — the Azov Horison where mollusc fauna has transitive character (between Pontian and Kimmerian) and has direct magnetization and correlates with paleomagnetic Epoch 5.

Middle and Upper Kimmerian (Kimmerian stage sensu stricto A n d r u s o v, 1907) according to zones alternation of direct and inverse magnetization correlates with Gilbert paleomagnetic epoch. At the base of Kimmerian of the Euxinian Basin the erosional phase is clearly observed, which corresponds to the East Caucasus phase of the orogenic movements.

Akchagylian deposits for its magnetization character were reffered to the Gauss paleomagnetic Epoch and lower part Matuyama Epoch (M e n n e r et al., 1972). Doubled epizode of Gils direct polarity (Gils—Olduwey) was fixed in the lower part of the Apsheronian stage in the Caspian Basin and in its stratigraphic equivalents — in the Gurian beds of Black Sea Basin.

Identification of Gils episodes of the Matuyama epoch — that is level of 1.8 m.y. both in Caspian and Black Sea Basins — is corroborated by the extinction of *Discoaster brouwery* (NN18) "last appearance" of which was fixed in the upper part of Akchagylian in both basins. Brunes—Matuyama boundary is drawn at the top of the Apsheronian.

General glacioeustatic lowering of the World Ocean's level-sea that took place 6.5 m.y. ago and had caused the Messinian "salinity crisis" in the Mediterranean (R y a n — C i t a et al., 1974) had aroused transgression of the Pontian epicontinental lake-sea.

Transgression and regression of the Caspian Sea were developing in counterphase with respect to fluctuation of sea-level. Cooling and humification had decreasing evaporations of this lake-sea and during ocean regressions the Caspian Sea was transgressing. This fact was fixed for the changes of Caspian level in Pleistocene during the glaciations and interglaciations. Fall of temperature that took place 6.5 m.y. ago is fixed in the Lower Pontian deposits of Euxinian where numerous exotic boulders of the crystalline rock were found.

Thus, we had ascertained that adopted by a majority of researches the boundary between the Miocene and Pliocene in the Black Sea Basin at the base of the Pontian top of the Meotian coincides with the boundary between the Middle and Upper Miocene in the Mediterranean region (that is with Tortonian—Messinian boundary, and Miocene—Pliocene boundary which is drawn in the Mediterranean at the top of Messinian — base of Zanclean and has age of 5.8 m.y. in the Euxian Basin would take place over the Pontian at the base of the Camyshburunian Horison of the Kimmerian stage (Kimmerian stage, s. str. A n d r u s o v), and Lower Kimmerian Horison of the sea of Azov defined later and refers obviosly to the Miocene.

Table 1

Correlation and isochronous boundaries of the Upper Miocene and Pliocene of East Paratethys and Tethys

MEDITERRANEAN				PONTO—CASPIAN	
Nakagava et all., Ryan—Cita, 1975		Berggren—Van Couvering, 1974		Semenenko—Pevzner, 1979	
base of Calabrian Olduwai event of Matuyama epoch	1.8 m.y.	Pliocene/ Pleistocene (base of Calabrian)	1.6—1.8 m.y.	base of Apsheronian	1.8—1.9 m.y.
		Zanclean/Piazenzian Early/ Late Pliocene	3.3 m.y.	base of Akchagilian	3.2—3.3 m.y.
base of Zanclean approximate the lower of Gilbert epoch	5.1 m.y.	Miocene/Pliocene	5.0 m.y.	base of Kamyshburunian horison of Kimmerian (Kimmerian s.str. Andrusov in stratotype)	5.2 m.y.
base of Messinian takes place at top of epoch 7	6.6 m.y.	Tortonian/ Messinian	6.6 m.y.	base of Pontian	6.5 m.y.
base of Tortonian is at the base of epoch 11	12 m.y.	Serravalian/ Tortonian (Middle—Late Miocene)	10.5—10.7 m.y.	base of Meotian	9 m.y.

Many investigators consider that boundaries of stratigraphic sudbivisions observed throughout world represent almost synchronous levels.

In the Tab. 1 are given data for stage scale of Mediterranean and Euxian—Caspian received by various investigators independently one from others suggest to some extend rightfulness of such statements.

However, it should be noted that in the complete successions on the Meotian—Pontian boundary in Crimea interruption in absent as well and there is a very gradual transition, although in the strata of the Late Meotian together with *Congeria amygdaloides* the first brakish-water Pontian cardiides appear.

Although our researches of Miocene—Pliocene boundary had reduced to give a new glance on the history of the geological development of Paratethys and Tethys just at this border and to analyse in the light of new data.

On the first view new boundary (tracing for nannoplankton data) proceeding from the only "biostratigraphic" data does not reflect any significant changes in the composition of benthic mollusc fauna.

Succession in the fauna of brakish cardiides and ostracods of the Pontian and Kimmerian is well known and acknowledged by all investigators.

Great geological events took place just at this boundary, however without any essential changes in the hydrological regime of brakish-water Pontian—Caspian. The largest regression in the Neogene of East Paratethys had occured after the Early Pontian, when great surface of Fore Black Sea Monocline — from South slope of the Precambrian Ukrainian Shield, had evaporated including flat Crimea and shelf continental slope of Black Sea Basin.

Late Pontian deposits are located only in the southernmost part of Indolian—Cubanian trough and Black Sea coastline of Caucasus.

At the end the of Lower Pontian united basin striking from the Mediterranean on the East to the Nebit-Dag in Turkmenia stopped existing.

Enormous regression was caused by fault of the waters of epicontinental Caspian into Mediterranean.

Level of the Pontian Sea in the Messinian was higher than the Mediterranean one.

Due to erosion and downcutting of valleys into Mediterranean, a drainage of the Early Pontian basin took place, i.e. fault of its waters into the East part of the Mediterranean, where lake-sea sediments (lago-mare) were formed.

Thus, Miocene—Pliocene boundary in time dimensionally reflects stage of the formation of Mediterranean, Black and Caspian Seas.

On the question — when the Black Sea (more exactly — Azov-Black Sea Basin) was formed — we can answer just so — during Kimmerian, when at place of the Azovian Basin East Euxinian Basin (that is more broad in dimension that Azovian one) was existing. East Euxinian Basin (according to paleogeographial terminology of Andrusov — Ebersin) was connected with Euxinian Basin by vide strait (in region of present Kerchenesky strait, but more wide). Recent river drainage in the Black Sea area was formed after the Early Pontian time.

At the Pontian—Kimmerian boundary the East Caucasian or simple Caucasian phase of the orogenic movements took place, which was fixed even in the depressions like a washouts and unconformities at the base of Kimmerian of the Black Sea Basin. This phase had exhibited in the Lower Kimmerian in very various mountain regions of the south of the USSR (from the Carpathian, Caucasus to southwest of Tien-Shan, Tajic depression, Altai, Sayany and territory beyond the Lake of Baikal) (Kozhevnikov, 1979).

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