ISSN 1028-334X, Doklady Earth Sciences, 2007, Vol. 412, No. 1, pp. 17–18. © Pleiades Publishing, Ltd., 2007.
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GEOLOGY

Age and Origin of the Kerch Strait and the Sea of Azov

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Presented by Academician Yu.M. Pushcharovsky, February 13, 2006

Received February 17, 2006

DOI: 10.1134/S1028334X07010047

Study of the southern seas of the former Soviet Union is crucial for the prospecting and exploration of new oil, gas, and solid mineral deposits on their continental shelves.

The origin of the Kerch Strait is attributed to either erosional or tectonic processes [1, 8, 9, 14]. Geophysical studies confirmed the tectonic nature of the strait. The main role in its formation belongs to the Kerch–Zhdanov fault, which was most typical of the Cretaceous–Paleogene [14]. Study of Neogene and Quaternary sediments from many piston and drill cores taken in the strait [5] has revealed the significant contribution of neotectonic and erosional processes in its development. The strait bottom is composed of anticlinal uplifts and synclinal troughs filled with Sarmatian and Meotian sediments overlain by Quaternary horizontal strata. The majority of researchers believe that the Kerch Strait was separated during the Chauda period from the Enikal Strait that occupied a tectonic depression between folded structures of the Crimea and Caucasus [9, 13]. The existence of the Kerch Strait at that time is evident from the structure of the Caucasian and Kerch mineralogical provinces. The absence of some minerals, such as kyanite, staurolite, and sillimanite, in Kerch province indicates their transport by rivers from the Caucasian coast via the Kerch Strait [9]. The geological structure of the Azov and Black seas (hereafter, ABS region) in the Middle–Late Pleistocene [7] suggests accumulation of Paleoeuxinian, Karangatian, and Neoeuxinian sediments in this region that was occupied by bays of the Mediterranean, Black, and Caspian seas. The retreat of the Karangatian sea was followed by intense regression, a long-term continental regime, and sharp fall in sea level.

Atlases of paleogeographic maps of the Sea of Azov demonstrate that this region was occupied by land with the paleo-Don River flowing into the Black Sea via the Kerch Strait. This period was characterized by intense deepening of the Kerch Strait and formation of a wide delta at its mouth [3]. The terminal Karangatian time was marked by discharge of Khvalynian transgression waters from the Caspian Sea into the future Sea of Azov via the Manych Strait, resulting in the deposition of thin fluvial–lagoonal sediments of the Azov–Khvalyn Horizon [6]. The *Dreissena* representatives, which populated the Caspian Sea, were ancestors of the Neoeuxinian fauna of the ABS basin. The Neoeuxinian phase was marked by a large transgression that exceeded the erosion base level of the paleo-Don River and deposited a thick alluvial sequence in both the Kerch Strait and adjacent areas of the Sea of Azov. In the geological section of the ABS region, the transgression is marked by a distinct succession of fluvial, fluvial–lagoonal, and marine sediments. The thickness of marine sediments increases to 40 m toward the Sea of Azov [9].

Specific features of the structure of the Neoeuxinian geological section, the shift of the paleo-Don River mouth toward the Sea of Azov, and the thickening of marine sediments from the west to east indicate the transgression of the Black Sea rather than the Caspian Sea [11]. Cold and warm periods in the development of the region corresponded to regressions and transgressions, respectively. The Neoeuxinian transgression of

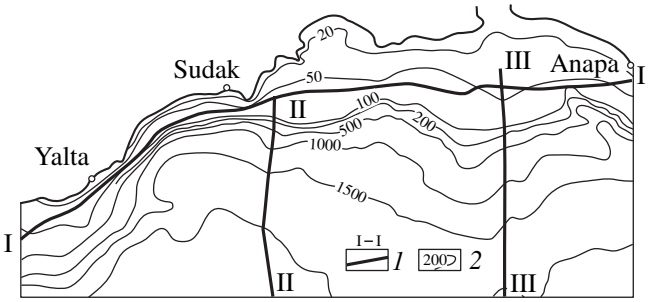

Fig. 1. Schematic chart of the Crimean segment of the Black Sea. (*1*) Geological profiles; (*2*) isobaths, m.

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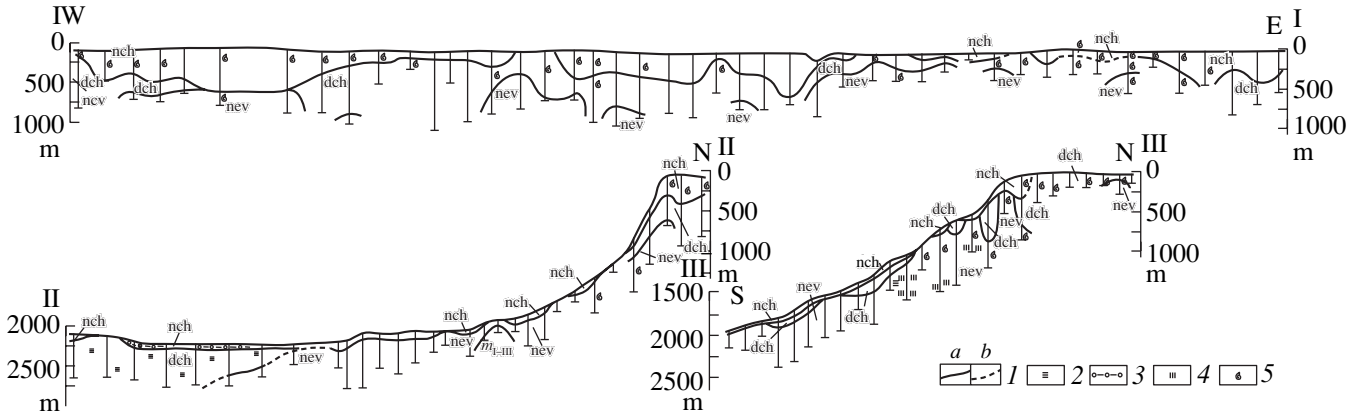

Fig. 2. Geological sections across the Black Sea shelf. (*1*) Boundaries: (*a*) proven, (*b*) assumed; (*2*) sediments with sapropel interbeds; (*3*) coccolith ooze; (*4*) sediments with hydrotroillite; (*5*) finds of molluscan shells; (nch) Novochernomorian; (dch) Drevnechernomorian; (nex) Neoeuxinian; ($m_{I–III}$) undivided Pleistocene marine sediments.

the cold period does not fit this model and needs to be explained. Drilling data from the Black Sea region between Sudak and Yalta (Figs. 1, 2) provide insight into this issue. In this area, Neoeuxinian beds with abundant *Dreissena* shells occur at significant depths of the inner shelf and continental slope (up to 1200–2000 m). Many researchers have reported finds of Cimmerian, Gurian, Paleoeuxinian, Karangatian, and other strata. These finds were attributed to tectonic movements [3, 7]. Arkhangel'sky and Strakhov [4] assumed tectonic subsidence of the "sea bottom." Seismoacoustic observations carried out on the continental shelf and slope [10] confirmed significant tectonic subsidences. The strata with Neoeuxinian *Dreissena* species are dated at 13 ka [12]. Since that time, the shelf could subside to depths of 1.5–2.0 km with a rate of 10–15 cm/yr, given that *Dreissena* representatives occupied depths up to 100 m. Such significant subsidence can be related to a large tectonic catastrophe such as an earthquake.

Due to tectonic subsidences, the shelf area with the adjacent Kerch Strait and Azov alluvial plain occupied the lower bathymetric level. The instantaneous flooding of this region by the Black Sea resulted in the formation of the present-day Sea of Azov 13 ka ago. It is evident that the deep Black Sea basin formed after the Neoeuxinian time [7]. During the period of 25 to 10 ka ago, the Black Sea level did not exceed –40 m. This level was governed by the depth of the Bosporus Threshold (–40 m), which served as a pathway for the unidirectional river runoff to the Sea of Marmara [2]. The Kerch Strait predated the Bosporus Strait. If the flow to the Black Sea via the Bosporus did not exist during the Late Pleistocene, how could the Karangatian transgression of the Mediterranean Sea penetrate the ABS basin? Obviously, the transgression advanced along the Izmid–Sapanka–Sakaria line, where the sea level was at –37 m, i.e., higher than the Black Sea level. In ancient times, Lake Sapanka represented a sea gulf that continued Izmid Bay [2, 15]. Since the Holocene, the Black and Mediterranean seas have been connected permanently via the Bosporus and Dardanelles. The seismoactive shelf and continental slope in the Sudak–Alushta–Yalta area deserves particular attention. This area outlined by isoseist with $M = 8$ was the site of the strong Crimean earthquakes of 1927 and 1940.

REFERENCES

1. G. V. Abikh, Zapiski Kavkaz. Otd. Russ. Geogr. Ob-va **8**, 3 (1873).
2. I. A. Avenarius, Vestnik MGU, No. 6, 108 (1977).
3. N. I. Andrusov, Izv. Ros. Akad. Nauk **12** (1), 23 (1918).
4. A. D. Arkhangelsky and N. M. Strakhov, *Geological Structure and Development History of the Black Sea* (AN SSSR, Moscow, 1938) [in Russian].
5. I. M. Barg, I. P. Yalovenko, and Yu. G. Yatsenko, Dokl. Akad Nauk SSSR **246**, 164 (1979).
6. I. M. Barg, O. G. Sidenko, A. V. Vishnevetskii, et al., Izv. Vyssh. Uchebn. Zaved. Ser. Geol. Razv., No. 4, 28 (1990).
7. I. M. Barg, *Upper Cenozoic Biostratigraphy of Southern Ukraine* (Dnepropetrov. Gos. Univ., Dnepropetrovsk, 1993) [in Russian].
8. N. S. Blagovolin, Izv. AN SSSR, No. 2, 105 (1960).
9. E. F. Shnyukov, V. M. Alenkin, A. L. Put, et al., *Geology of the Shelf of the Ukrain.SSR. The Kerch Strait* (Naukova Dumka, Kiev, 1981) [in Russian].
10. B. F. Zauzolkov, N. M. Nesmelova, V. A. Petruk, et al., Izv. Vyssh. Uchebn. Zaved. Ser. Geol. Razv., No. 7, 103 (1989).
11. G. I. Popov, *Pleistocene Sediments of Straits between the Black and Caspian Seas* (Nauka, Moscow, 1983) [in Russian].
12. V. N. Semenenko and N. N. Kovalyukh, Geol. Zh. **33** (6), 91 (1973).
13. V. N. Semenenko and O. G. Sidenko, in *Late Quaternary History and Sedimentogenesis of Marginal and Inner Seas* (Nauka, Moscow, 1979), pp. 87–99 [in Russian].
14. A. V. Chekunov and Ya. P. Malovitskii, in *The Earth's Crust and Development History of the Black Sea Basin* (Nauka, Moscow, 1975), pp. 308–316 [in Russian].
15. M. Pfannestiel, Mitt. Geol. Gesel. Wien, **36/38** 257 (1943/1945).