

E/O biospheric crisis transition “warm” to “cold” biosphere of central part of extratropical Eurasia (stratigraphy, palaeogeography and palaeoclimatology)

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Biotic and abiotic events in the Middle Eocene and Oligocene (45–25 Ma) were studied for the period of transition from “warm” to “cold” biosphere in central Asia. The reference point was the beginning of elimination of direct marine communications between the Peri-Tethys and the Arctic Basin accompanied by reduction of silica deposition. The Late Oligocene stabilization of superregion, when the Turgayan mesophyllic flora had been set up, was regarded as termination of the transition period. The Late Eocene stage of “warm” biosphere was studied in reference sections of South Siberia, where paleontological research was conducted jointly with geochemical studies. The transitional stage was investigated in the Chelkar-Nury (Turgai) sections, where the Upper Eocene Chegan Formation gives way to Lower Oligocene sequence of avandelta sand of Urkimbai Formation and clay of the Chelkar-Nury Formation containing *Indricotherium*, was in the section of Borehole no. 8 south of Omsk-city. A special emphasis was laid on investigating *Azolla* beds, which developed in a semi-close marine basin with the estuary-type of sea water circulation, with a low level of the World Ocean. At that period the arrival of sea water from the Peri-Tethys was limited and inlet of fresh water prevailed. Along with water column differentiation, a freshened water stratum and anoxia of bottom water developed, being accompanied by appearance of suppressed benthos. At the period of the Late Tavidian transgression, the sea connection between the West-Siberian basin and the Peri-Tethys was restored, and the inner basin became saline again. The xerophilous palynological assemblage is located in the lower part of *Azolla* beds and in underlying Lower Tavidian Bartonian clays. Their age coincides with that of the xerophilous assemblage of microfossils situated at the northern coast of the Peri-Tethys; it extends from the South Urals towards the Pavlodar area (Irtys River). Northward expansion of the arid zone in the Central Asia (up to Southern Siberia) coincided in time with the transformation of the West Siberian inland sea into a semi-closed basin. Simultaneously, a climatic belt of small-leaved flora developed in middle latitudes. It extended from Central Europe through Ukraine, Urals, and the southern part of the West Siberian plate into East Kazakhstan. The main rearrangement of marine biota in Central Asia at the Eocene-Oligocene boundary is described in a number of papers (Popov, Akhmetiev, et al., 2009; Akhmetiev et al., 2010). To submit the climatic curve for the Early Oligocene, in some parts of which xerophytes are alternated with hydrophytes, several sections were studied in North Ustyurt, north Aral, and Turgai districts in terminal sequences of the Chegan Formation (Priabonian) up to the roof of the Solyonovsky horizon (Late Rupelian). In the Early Oligocene, the humid and arid phases developed the general cooling tendency. That was confirmed by rhythmic alternation of palynospectra, dominated by the pollen of plants, which have different humidity characteristics: *Pinus*, xeromorphic *Quercus*, *Ephedra*, Chenopodiaceae, and others (xerothermal phase), Taxodiaceae, Mesophytic, and hydrophytic ferns, reduction of herbaceous pollen (humid phase). Five inversions of humid characteristics occurred during the Early Oligocene. Two sea incursions were recorded from the Turanian basin to West Siberia through the Turgai Strait.

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