Geophysical Research Abstracts, Vol. 9, 05556, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-05556

Paleogene oxygen depletion episodes in the northeastern Peri-Tethys: A regional response to global events

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In the Paleogene, the NE Peri-Tethys represented a wide epicontinental basin strengthened for more than 3000 km from Crimea to Central Asia. For the most part of this time span, it was widely connected with the Tethian realm and characterized mostly by normal oxic environment, but in the Oligocene, the water interchange between basins became deteriorated. In the early Paleogene, sporadic oxygen depletion episodes (ODEs) occurred throughout the water area in discrete intervals being a repercussion of global and supraregional environmental events. The first ODE correlated with Paleocene-Eocene Thermal Maximum (PETM) appeared at the lowermost NP10 nannofossil Zone, when organic-rich sediments (TOC up to 10-20%) accumulated during rapid eustatic transgression. The negative excursion of delta13O in both organic matter and carbonates, negative delta18O excursion, and increased concentrations of many redox-sensitive elements (Mo, Se, Cu, Zn, Re, a.o.) are featured for these sediments (Gavrilov et al., 2003). Significant changes in microfossil assemblage including general decrease in calcareous plankton productivity, benthic foraminifera disappearance, occurrence of short-lived nannoplankton and planktonic foraminifera species, significant fluctuations in proportion of planktonic taxa, and bloom of Apectodinium augustum dinocysts show the biotic response to this critical event. A series of sapropelitic interlayers (from 1 to 8 in different parts of area) accumulated in the late Ypresian (upper NP12-lower NP13 Zones, TOC up to 3.5%) forming cyclic sequence against the regressive trend. The sediments rich in organic carbon are marked at the same interval in Syria, Morocco, and North Sea; short-term isotopic X-event found in oceanic setting (Roehl et al., 2006) correlates with the base of this sequence. Noticeable delta13C and delta18O excursions (up to 3.5 and 3.0 per mille respec-

tively) are detected (Oberhansli and Beniamovskii, 2000), but they are inversely correlated between benthic and planktonic forams. Occurrence of Discoaster/Sphenolithus-dominated (up to 60%) nannofossil assemblage and positive delta18O excursions at the bases of isolated sapropelitic beds more likely suggest short-lived episodes of farther warming during climatic optimum and salinity excess due to monsoon weakening. Persistence of benthic forams and geochemical signals do not show evident anoxic conditions, but disoxic environment follows from high infauna/epifauna ratio (Stupin, in press). Thus, the late Ypresian climatic optimum appeared to be much more dramatic in the Peri-Thetyan basin than it was found in oceanic settings. In the Bartonian (upper NP16-NP17, TOC up to 5-7%), the new much more long-lived ODE is documented (Kuma Fm.) throughout northeastern Peri-Tethys for more than 2 m.y. Initial stage of this episode evidently corresponds to transgressive phase and Middle Eocene Climatic Optimum (MECO). Initially, disoxic conditions predominated in the basin, as evidenced from oppressed benthic forams (Beniamovskii et al., 2001), and bottom anoxia occurred sporadically only. At the same time, abundant and diverse calcareous plankton survived in the photic zone. At later stage, anoxic environment developed. Benthic forams disappeared, and nannofossils show cyclical alternation of normal marine and poor monospecific Reticulofenestra assemblage in isolated intervals that more likely suggests short-lived episodes of fresh water inputs. The Eocene/Oligocene boundary is marked by sharp change from the predominant in the early Paleogene carbonate sedimentation to clayey one (Maikop Fm.). The paleontological and geochemical signals attest wide occurrence of anoxic environment persisted in the Oligocene-early Miocene (˜17 m. y.), which was sporadically interrupted by oxic/suboxic conditions and/or fresh water input in discrete time intervals. This long-lived ODE was more likely caused by the ventilation decay of the deeper part of Peri-Tethyan basin due to weakened connection to the Tethys and dramatic sea-level fall caused by Antarctic ice sheet occurrence. Evidently, the Paleogene ODEs in the NE Peri-Tethys are of different nature, duration, and development pattern, but in all cases their onset is directly related to any more or less dramatic global event. This work is supported by RFBR projects nos. 04-05-64835 and 06-05-65282.