High-resolution study of PETM record in the key section of NE Peri-Tethys

Ekaterina Shcherbinina, Yuri Gavrilov, Olga Golovanova, Boris Pokorvsky
Geological Institute RAS, Moscow, Russia (katuniash@gmail.com)

In the lithological record of NE Peri-Tethys, sediments corresponding to Paleocene/Eocene Thermal Maximum (PETM) are displayed as sapropelitic bed (SB) extended over the wide territories. Recent study showed the SB correspondence to carbon isotope excursion (CIE), decline of benthic foraminifera, occurrence of short-lived nannofossils *Rhomboaster* spp. and asymmetric discoasters, acme of *Apectodinium augustum* dinocysts (Gavrilov et al., 2003). To better understand the exact consequence of all events involved into PETM development in the NE Peri-Tethys, we made new thorough collections of the SB and surrounding sediments in the key section exposed along Kheu R., Kabardino-Balkaria, northern Caucasus, Russia. The SB was sampled with 2 cm frequency and underlying and overlying sediments – with 15 cm frequency.

Underlying the SB sediments are soft greenish marls containing abundant and diverse nannofossils and showing gradual $\delta^{13}C$ decrease from 2.5‰ to 1.5‰. ~1.3 m below the SB, 10 cm thick clayey layer evidently related to dramatic sea-level fall occurs. Just below this level, first representative of *Rhomboaster* lineage (*R. intermedia*) appears. Above this erosional (?) surface, nannofossil abundance drop significantly causing low $CaCO_3$ content culminated in 12 cm thick non-calcareous clay underlying the SB. *Rhomboaster* cf. *cuspis* first appear ~0.5 m below the SB with the beginning of $\delta^{13}C$ decrease.

The SB (0.5 m) is built up of rhythmic alternation of non-calcareous black thinly laminated clay (8–10% TOC) and brown calcareous clay (3–5% TOC) forming 5 couplets. At the base of SB dramatic negative $\delta^{13}C$ (2.9‰) and $\delta^{18}O$ (5.5‰) excursions and both curves show significant fluctuation within the SB. FADs of *Apectodinium augustum* and *Wilsonidium pechoricum* dinocysts are found at the base of SB (see Iakovleva et al., this volume). Lowermost part of SB is the most enriched in TOC and lack in nannofossils. Poor nannofossil assemblage reappears in the calcareous layer of lower couplet where *Rhomboaster* spp. and asymmetric *Discoaster anartios* and *D. araneus* appear. Wide fluctuations in the ratio of *Discoaster*, *Toweius* and *Fasciculithus* between couplets are marked and calcareous dinocysts *Thoracosphaera* spp. become abundant at individual levels (up to 40%). All these characterizes very warm and frequently changing nutrient-rich environment during SB accumulation.

Negative $\delta^{13}C$ excursion persists in the 0.5 m interval of greenish calcareous clay overlying the SB and begins gradually decrease upsection but never reaches pre-PETM level (2–2.5 ‰) keeping values around 1‰. All nannofossil taxa declined during SB accumulation became recovered in overlying sediments including typical for late Paleocene species of *Heliolithus, Fasciculithus, Toweius, Neochiastozygus,* and *Placozygus sigmoides*, as well as “excursion” taxa of rhomboasters and asymmetric discoasters, and this assemblage persists up to facial change to cherty deposits in ~4.0 m above the SB where few nannofossil specimens only can be find.

The main conclusion of this study is the finding that minor environmental perturbations preceded exceptionally rapid and dramatic PETM onset and recovery of normal environment occurred very gradually. Nannofloral communities almost completely survived during PETM in the basin of NE Peri-Tethys but disappeared during recovery period.

RFBR Project no. 09-05-00872