Mid-Cretaceous anoxic events as documented in the NE Peri-Tethys

E. Shcherbinina & Y. Gavrilov

Geological Institute RAS, 119017-Moscow, Russia (katuniash@gmail.com)

A complete succession of mid-Cretaceous anoxic events is detected in the sedimentary record of eastern Caucasus where they are pronounced as black shale (BS) intercalations and negative or positive δ13C excursions of different magnitude. Valanginian-Aptian BSs occur within shallow siliciclastic sequences. Late Valanginian Weissert Level (~2.0 m, 0.9% TOC) is found within oyster-rich siltstone lack in calcareous microfossils. Faraoni Level (~1.5 m, 1.8% TOC) appears during relative deepening of the basin and exhibits major turnover in nannofossil assemblage including decline of hemipelagic oligotrophic nannoconids and increase in abundance of warm-water and eutrophic taxa. The latest stage of event is characterized by Watznaueria bloom that evidences dramatic ecological stress.

In the lower Aptian, a series of BS intercalations (> 1.0 % TOC) made up of non-calcareous mudstone is embedded into siltstone sequence. Lack of calcareous microfossils does not allow precise age definition and we can only suggest its correlation to OAE1a.

General deepening of the basin in the late Aptian caused reorganization in sedimentary pattern andappearance of abundant and diverse microfossils. Albian to Cenomanian sequence shows rhythmical alternation of dark marlstones and pale limestones rich in TOC at individual levels. Latest Aptian BS (from 0.3 to 0.9 m in different sections, >6% TOC) evidently corresponds to earliest OAE1b (Jakob Level). Mesotrophic nannofossils of underlying sediments give the way to oligotaxonic assemblage of the BS where dinocysts become removed. Organic matter (OM) is mainly of basinal (algal?) nature (336 HI). Three BSs correlated to later episodes of OAE1b are found in the ~20 m thick early Albian interval. The lower BS (~1.5 % TOC, 92 HI) is characterized by terrestrial OM, warm-water eutrophic nannofossil assemblage and diverse dinocysts. Contrarily, two latest BSs (5.5 and 4.5% TOC) are made mainly of basinal OM (449 and 487 HI) but also featured by diverse nannofossils with higher abundance of warm-water and eutrophic taxa showing minor variations in species ratio that do not imply significant environmental stress in surface water.

The ~5 m thick BS at the middle/upper Albian transition (OAE1c, 4.8% TOC) also displays a change from terrestrial OM of underlying sediments (50 HI) to mainly basinal OM of BS (348 HI) which contains very poor nannofossils. The latest Albian ~10 m thick BS interval (OAE1d, 1.7% TOC) is characterized by decrease of basinal OM fraction from bottom (248 HI) to top (50 HI) and nannofossils largely dominated by eutrophic taxa. OAE1d is marked by relative cooling registered by both δ18O positive excursion and lower abundance of warmwater nannofossils.

Three BS intervals are found in the Cenomanian succession. The most dramatic geochemically and biotically is OAE2 (0.8 m, 8.3% TOC) featured by positive δ13C (~2.0‰) and negative δ18O (~5.8‰) excursions. OM composition displays highest content of basinal fraction (694 HI). Monotaxonic nannofossil assemblage is composed of the most resistant to environmental perturbations and diagenetic dissolution Watznaueria spp.

The record of mid-Cretaceous OAEs in the NE Peri-Tethys showed different scenarios of basin fertilization and biotic response during individual events and values of TOC concentrations in related BSs do not reflect the dimensions of paleoecological stress but rather suggest variations in water column stratification.