# Environmental response to climatically driven lake-level fluctuations: record from Stephanian B freshwater reservoir of eastern tropical Pangea (Mšec Member, Kladno-Rakovník Basin, Central Bohemia)

R. Lojka[1], J. Drábková[1], J. Zajíc[4], J. Franců[5], I. Sýkorová[3], T. Grygar[2]

[1]Czech geological survey, Praha 1, Czech Republic;, richard.lojka@geology.cz
[2]Institute of Inorganic Chemistry, ASCR, v. v. i., Řež, Czech Republic, grygar@iic.cas.cz
[3]Institute of Rock Structure and Mechanics, ASCR, v. v. i., Praha 7, Czech Republic, sykorova@isrm.cas.cz
[4]Institute of Geology, ASCR, v. v. i., Praha 6, Czech Republic, zajic@gli.cas.cz
[5]Czech goological survey, Brno, Czech Republic, juraj.francu@geology.cz

The Mšec Member, the lower part of the Slaný Formation, is a high-resolution palaeoclimatic record of the Stephanian B in equatorial Pangea. It consists of thinly seasonally laminated organic-rich silty claystones with scarce laminas of fine-grained sandstones and argillized and/or carbonatized tuffs representing deposits of a tropical freshwater reservoir with approximate area of 10 000 km2. The lake existed for several tens of thousand years, assuming that organic-rich laminas within mineral matrix have a seasonal origin (Skoček, 1990).

We retrieved 2 cores including more than 30 m of sediments covering the entire lake lifetime. Chemical and X-ray diffraction analyses were used to determine the weathering conditions in the includig determination of the concentration of expandable clay minerals and Ca/Mg ratio in their interlayer. Lake hydrology was evaluated using mineralogy and stable isotope composition of authigenic carbonates consisting mainly of siderite with mean formula Fe0.7Mg0.21Ca0.07Mn0.02CO3 and minor low-Mg calcite The lake productivity was evaluated from micropetrography, molecular composition and pyrolytic properties of organic matter, and from macrofossil remnants. To complete the picture on environmental changes the palynological analyses were carried out.

The analyses revealed the lake passed trough several stages of development that were closely linked with environmental changes in watershed, namely in weathering character and relative distribution of biomes. Initial stage bear clear marks of lake high-stand with peak productivity and well oxygenated water column, but the most pronounced lake-floor dysoxia, coupled with advanced chemical weathering in the watershed. The high-stand was followed by gradual lake regression triggered by decreasing annual precipitation followed by increasing seasonality linked with decreasing weathering intensity and growing lake water mineralization. Lake regression was accompanied by sharp decline in productivity and change in dominant organic matter producer from phytoplankton to macrophytic aquatic plants. Temporal low-stand with several sandy turbidity layers was followed by partial lake recovery, marked by local peak of productivity and increased P/E ratio. Subsequent gradual shallowing resulted in the final lake transition to a lacustrine-deltaic system with fluctuating water table.

The distribution of spores and pollen grains assemblages indicate close links between the floral evolution and lake development. Diversified assemblages of xerophilous elements (monosaccate and bisaccate genera *Potonieisporites, Florinites, Guthörlisporites, Candidispora, Wilsonites, Latensina, Pityosporites, Limitisporites, Kosankeisporites*, and *Protohaploxipinus*) prevailed during the initial lake high-stand suggesting dense vegetation cover of surrounding uplands during humid non-seasonal climate. Spores pertaining to ferns became abundant during the lake regression indicating probably the colonization of emergent lakesides by the fern-dominated assemblage. Spores of lycopsids prevailed during the low-stand and subsequent second lake transgression probably due to their better adaptation to the frequently flooded swamp environment.

The observed regional changes can be attributed to the Milankovitch-like climate oscillations between warm-wet and warm-seasonal dry climate regimes.

**Reference**

Skoček, V. (1990): The Stephanian lacustrine-deltaic sequence in central and northeast of Bohemia. *Sbor. geol. Věd, Geol.*, 45, 91 – 122, Prague (in Czech with English abstract).