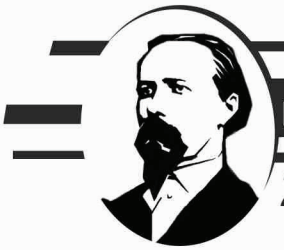
Kazan Federal University
Institute of Geology and Petroleum Technologies

Kazan Golovkinsky Stratigraphic Meeting 2019

Late Palaeozoic Sedimentary Earth Systems: Stratigraphy, Geochronology, Petroleum Resources

September 24-28, 2019, Kazan, Russia

ABSTRACT VOLUME



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Fifth All-Russian Conference "Upper Paleozoic of Russia"

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Abstract Volume

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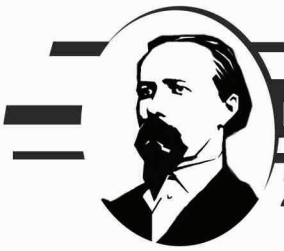

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Осадочные планетарные системы позднего палеозоя:
стратиграфия, геохронология, углеводородные ресурсы

Пятая Всероссийская конференция «Верхний палеозой России»

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The International Stratigraphic Meeting is dedicated to the Devonian, Carboniferous and Permian Earth systems, stratigraphic events, biotic evolution, sedimentary basins and resources.

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The importance of Paleozoic/Mesozoic sections in Central Europe, on the Russian Platform and in North America for correlation of late Carboniferous and Permian to Middle Triassic continental biostratigraphy to the Standard Global Chronostratigraphic Scale

Joerg W. Schneider[1,3], Valeriy K. Golubev[2,3], Vladimir V. Silantiev[3], Veronika Zharinova[3], Frank Scholze[4], Spencer G. Lucas[5]

[1]TU Bergakademie Freiberg, Freiberg, Germany; Joerg.Schneider@geo.tu-freiberg.de
[2]Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow, Russia
[3]Kazan Federal University, Kazan, Russia
[4]Hessisches Landesmuseum Darmstadt, Darmstadt, Germany
[5]New Mexico Museum of Natural History, New Mexico, USA

The Carboniferous, Permian, and Triassic chronostratigraphic scales based on marine deposits and fossils are reasonably well defined and of global utility, but the situation is much different for nonmarine deposits of this time interval. Due to the Carboniferous-Permian glaciation, the Hercynian-Appalachian-Ancestral Rocky Mountain, and Uralian orogenies, and other plate tectonic processes, numerous mixed marine-continental and, especially, purely continental basins from tens to thousands of square kilometers in size developed across the vast Pangean supercontinent. Apart from their economic importance (coals, hydrocarbons, salt, fire clay, etc.), those basins record the interplay between extrinsic and intrinsic processes that ranged from orbital cycles and climate fluctuations to volcano-tectonics and marine trans- and regressions as well as the evolution of biota and environment, including mass extinctions. During the last few decades a variety of bio- and chronostratigraphic methods has been developed and successfully applied in order to correlate continental deposits locally (intra-basinally) and regionally (inter-basinally). For the nonmarine-marine correlation especially, biostratigraphic methods have been proven to be useful that are based on conchostracans, blattoid insects, branchiosaurid amphibians, tetrapod footprints and skeletons of terrestrially- adapted tetrapods. Direct cross correlation of the nonmarine biochronologies to the Standard Global Chronostratigraphic Scale (SGCS) has been achieved in those parts of the late Carboniferous to the Middle Triassic interval in locations where nonmarine and marine strata are intercalated, containing nonmarine and biochronologically significant marine fossils. Calibrations of nonmarine biochronologies have been aided by magnetostratigraphy, chemostratigraphy and a growing database of radioisotopic ages. For the late Carboniferous up to the late early Permian, mixed marine/continental sections in New Mexico have provided several direct links of the insect and conchostracan biochronology to the marine conodont biochronology of the SGCS. This is in part well supported by isotopic ages from Western European sections. For the latest early, the middle and late Permian, the detailed and well-established bio- and magnetostratigraphy of the strata of the Russian Platform form the backbone of nonmarine-marine correlations. This is mainly based on the Russian tetrapod assemblage zones within the global biochronological framework of land-vertebrate faunachrons as well as on the increasingly improved conchostracan biochronology. South African sections, representative of parts of Gondwana, are linked to the Russian Platform and partly to Western Europe by the tetrapod assemblage zones, which are well calibrated in South Africa by radioisotopic ages to the SGCS.

One substantial problem of Permian-Triassic stratigraphy is the placement of the Permian-Triassic boundary (PTB), because exclusively continental deposits cannot be directly correlated with marine index fossils to the Global Standard Section and Point (GSSP) for the base of the Triassic defined in the marine Meishan section of South China. Additional problems result from the lack of radioisotopic ages due to missing volcanic ash beds in the transitional Permian-Triassic profiles of Europe and those of the Russian platform. A solution of this problem is possibly provided by a combination of tetrapod assemblage and conchostracan biochronologies (here Fig. 1; Schneider et al., in press). The base of the *Tupilakosaurus* assemblage-zone is defined by the lowest occurrence (LO, or ?first appearance datum -- FAD) of *Lystrosaurus* in the magnetostratigraphic zone n_1NPT, which should be latest Changhsingian, in the uppermost Zhukovian regional stage, late Vyatkian. *Tupilakosaurus wetlugensis* appears first in the n_2NPT magnetostratigraphic zone higher up in the lower Vokhmian regional stage (Golubev, 2017). Therefore, the LO of *Tupilakosaurus wetlugensis* seems to be a good biostratigraphic marker for the regional PTB of the East European Platform. This is well supported by the conchostracan *Euestheria gutta*, which is a potential guide-form for the base of the Triassic (e.g. Scholze et al., 2015, 2017,

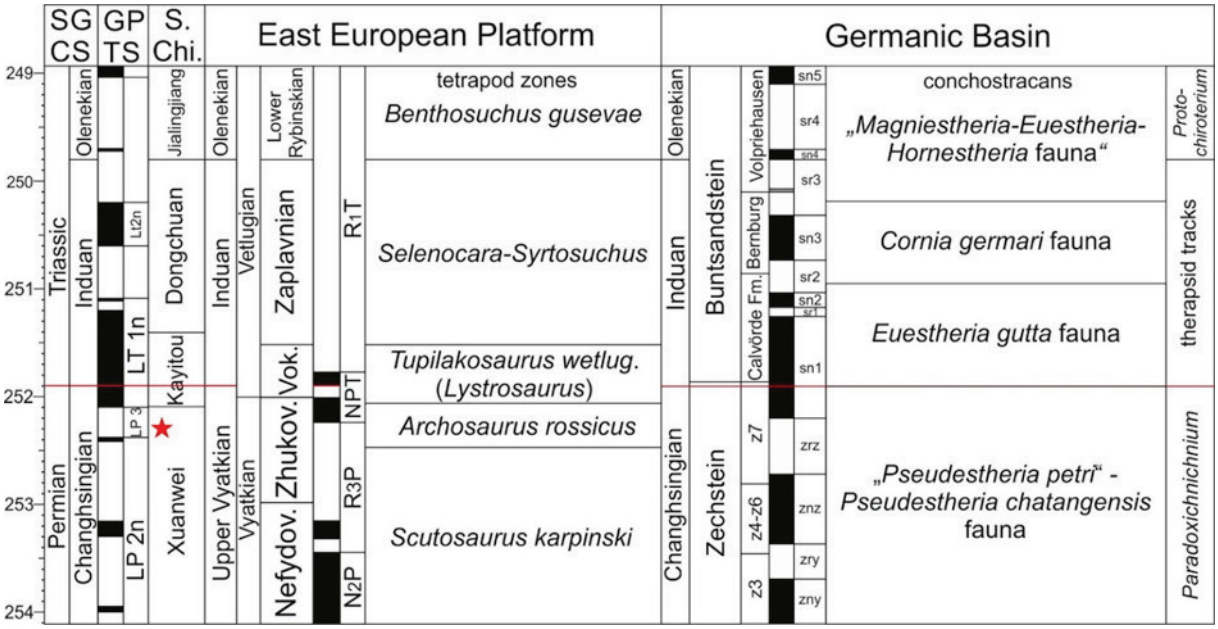

Fig. 1. Synoptic schema of correlations around the PTB (red line) from South China via the East European platform to the Central European Germanic basin. For South China the Chahe section is used, which is well correlated to the GSSP of the PTB at Meishan in South China by isotopic ages (Shen et al. 2018). In the Chahe section, *Euestheria gutta* appears 6 to 7 m above an ash bed that is dated as 252.30±0.07 Ma, marked by a red star (e.g. Zhang et al. 2016). On the East European platform, the PTB is drawn inside the *Tupilakosaurus wetlugensis* assemblage zone (Sennikov & Golubev, 2017) at the top of a short reversed interval (r_1NPT) inside the mainly normal polarized zone NPT (= LT1n magnetozone of Hounslow & Balabanov 2018). The thus far lowest occurrence of *E. gutta* is 5.5 m above the FAD (LO?) of *T. wetlugensis* in the middle Lower Vokhmian (Scholze et al. 2015, 2019). In the Central European Germanic basin, *E. gutta* appears first within the paleomagnetical normal polarized Upper Fulda Formation (z7) in the uppermost part of the Zechstein Group (e.g., Scholze et al. 2017, 2019; Schneider & Scholze 2018). The magnetostratigraphic zonation for the Germanic basin is based on a synthesis of paleomagnetic studies (i.e., Szurlies et al. 2003; Scholze et al. 2017; Hounslow & Balabanov 2018). The GPTS is based on Hounslow & Balabanov (2018). Abbreviations: SGCS – Standard Global Chronostratigraphic Scale; GPTS - Geomagnetic Polarity Time Scale; S. Chi. – South China; D – Dongchuan Formation; z – Zechstein cycle (from Schneider et al. in press)

2019 in review). This species appears in the Fedurniki section of the Vladimir Region in the Moscow syncline 5.5 m above the *Tupilakosaurus*-bearing base of the Ryabi Member of the Vokhma

Formation in the middle Vokhmian regional stage (Scholze et al., 2015). *Tupilakosaurus wetlugensis* and/or *Euestheria gutta* are thus far the best suited nonmarine index fossils for the PTB in Russia, Central Europe and China. A challenging future task will be the search for ash beds around the PTB on the Russian Platform to provide radioisotopic calibration of this index fossils as well as the search for this and similar index fossils outside their thus far known palaeobiogeographic distribution.

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