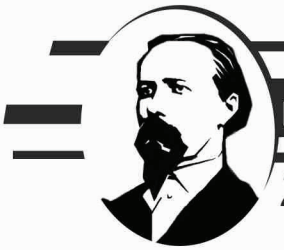
Kazan Federal University
Institute of Geology and Petroleum Technologies

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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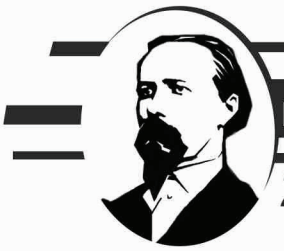

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Международная стратиграфическая конференция Головкинского 2019

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

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Were the Siberian Traps a trigger for the global Permo-Triassic extinction?

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The largest Permian-Triassic extinction of the Earth's marine and continental biota in the Earth's geological history is one of the most known and discussed problem in the geological and in the entire scientific community. This is due to modern global warming, analogues of which many researchers see in climatic changes at the Permian-Triassic transition. Despite the enormous information accumulated on this subject, many issues critical to the understanding of the problem remain unresolved. To date, uncounted number of hypotheses and models describing the causes of extinction have been suggested, but none of them are universally recognized. In recent years, most experts are inclined to believe that Siberian volcanism and the products of its eruption, as well as the impact of the traps on the erupted rocks (hydrocarbons and evaporites) are the main reasons for the sharp increase in carbon dioxide, sulfides and other sublimates in the Earth's atmosphere and in oceans. The trap eruption must have preceded to be a trigger of the global extinction and the degree of their impact on the biota of Siberia should be significantly higher than outside the area of trap volcanism. Therefore, the problem of the onset of Siberian trap eruption and the precise calibration of all phases of the development of trap volcanism is the most critical issue. We are studying this problem since 2017 with the grant from Ministry of Science and Higher Education of Russian Federation (contract No. 14.Y26.31.0029 in the framework of the Resolution No.220 of the Government of the Russian Federation. The work was carried out in several directions. First, to obtaining the precise radioisotopic dates from the Permian-Triassic transition in the continental deposits of Siberia. Second, collect and evaluate the taxonomic data of the biota at the transition. Third, integrate of all the data into a single array and develop a model geologic and biotic evolution of the region during Permian-Triassic transition. A multidisciplinary approach was applied, integrating stratigraphic, radioisotope, paleontological, biostratigraphic, sedimentological, geochemical and paleomagnetic methods. We obtained a precise radioisotopic ages (CA-IDTIMS) from several horizons within the transition and established the precise position of the Permian-Triassic boundary. A geochemical study of sections was aimed at constructing chemostratigraphy (organic carbon and gross rock geochemistry) and substantiating the position of the boundary. The paleomagnetic studies of Permian-Triassic deposits in Kuzbass were focused on the magnetic polarity's inversions and other magnetic properties of the rocks. All available data on the distribution of flora and various groups of fauna in marine and continental sediments are summarized and analyzed. A database that integrates all obtained data from the marine and continental sediments of Siberia, the East European Platform and Northern China

has been developed. Statistical methods and the CONOP (constrained optimization) software has been utilized for the analyzes of the data.

Our preliminary data indicate that the trap volcanism in Southern Siberia began at about the time accepted in South China as the time of the Permian-Triassic boundary and not preceded the extinction. The onset of the volcanism in Kuzbass and Tunguska basins are synchronous. The basaltic volcanism of these basins and the surrounding territories was Triassic, i.e. occurred after extinction in S. China and could not be a trigger of Permian-Triassic mass extinction there. In the Kuznetsk basin the onset of the trap volcanism is associated with the diversification of flora and fauna. Similar phenomenon was earlier reported in Tunguska Basin. All these suggest that (**a**) the biota changes at the Permian-Triassic transition in the Kuznetsk and Tunguska basins occurred differently than documented in the marine sections of China, (**b**) the Siberian traps stimulate the biota (especially flora) diversification, and (**c**) the biota change process in different regions of the world could be multidirectional and not necessarily everywhere abrupt and massive as it is postulated in numerous recent publications.

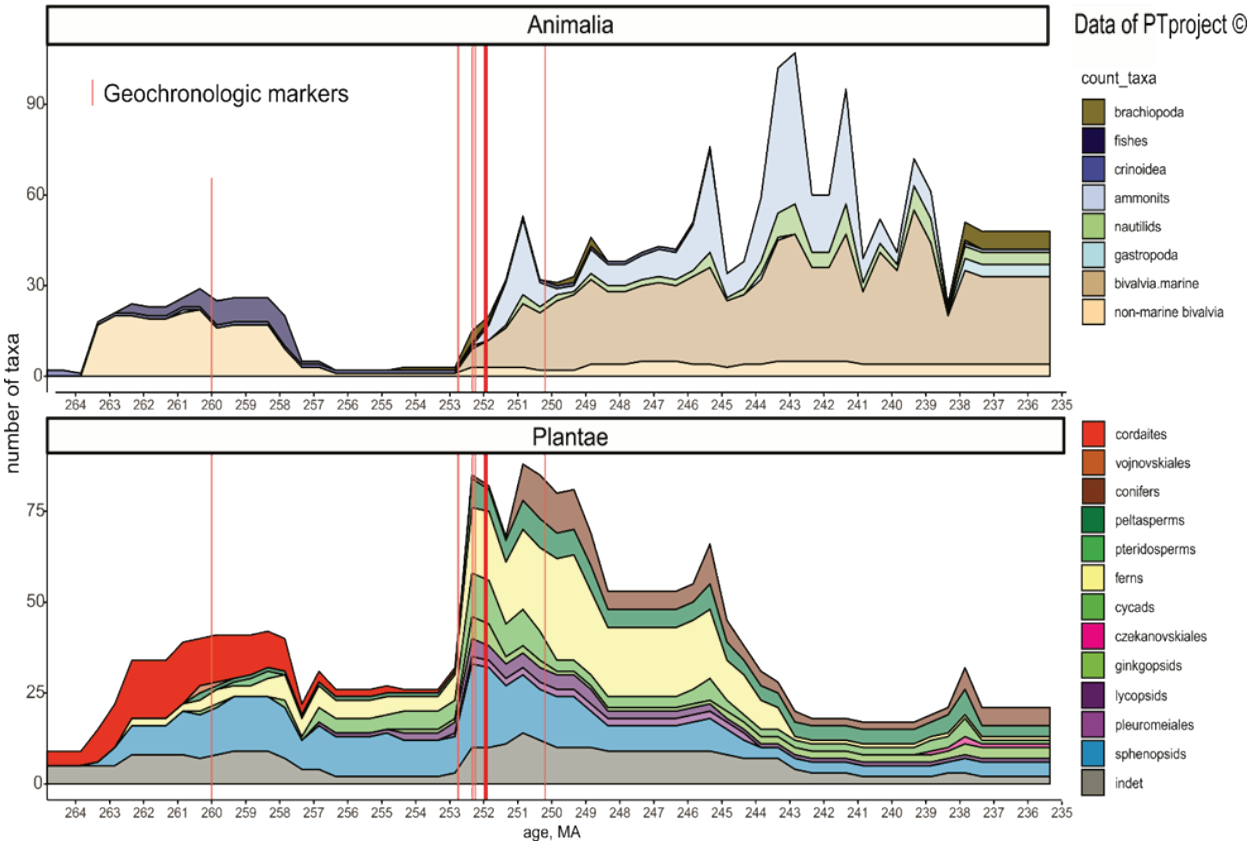

Fig. 1. Diversification of flora and fauna within the Permian-Triassic transition in Siberian Basins