

**COSMIC DUST IN THE DEPOSITS OF THE MOSCOVIAN AND KASIMOVIAN STAGES,
USOLKA SECTION, CISURALIAN FOREDEEP, RUSSIA**

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Introduction: Geologists drew attention to particles of cosmic dust in connection with the study of cosmic matter and the origin of the Earth, the degree of influence of terrestrial and cosmic processes on climatic and biotic events in geological history, the prospects for correlations of global, regional and local levels for different facies.

This report describes the morphology and analyzed the chemical composition of microspheres from the marine Carboniferous deposits of the Usolka section [2]. The Usolka section is proposed as a reference object, therefore in 2015yr a field excursion of the XVIII International Congress on Carboniferous and Permian Systems was held here.

Sample & Methods: The thickness of the investigated section was 12 m. 70 samples were processed; In 20 samples, microspheres were found in an amount from 1-2 to 20 pieces or more. The average diameter of the investigated microspheres is 135 μm (range 85-200 μm), they have a diverse relief surface (plaques, ledges, microcraters, triangular depressions, etc.). The microparticles were analyzed in the laboratory of the Kazan Federal University on the field emission scanning electron microscope "Merlin" Carl Zeiss equipped with an energy-dispersive spectrometer "AZTEC" X-MAX Oxford Instruments and using differential thermomagnetic analysis.

Results: The recalculation of chemical analyzes of microspheres showed that the polycrystalline aggregate of magnetite and wustite with a small fraction of native iron predominates in their mineral composition, which is confirmed by thermomagnetic analysis data. Such a mineral composition is characteristic for stony meteorites, which is confirmed by the arrangement of microspheres on the Si-Fe graph [1] in the impact-chondritic region.

Discussion: Analysis of negative isotopic anomalies of $\delta^{13}\text{C}$ in the Cisuralian foredeep, distribution of microspheres and Y-anomalies in the Usolka section showed [2] that one of the possible causes of geochemical anomalies could be meteorite bombardment with the formation of cosmic dust at the Moscovian-Kasimovian boundary (306-308 million years ago). The paleomagnetic supersonic reverse polarity of Kiam began 310 million years ago, which corresponds to the stabilization of internal terrestrial processes over the next 50 million years. Therefore, geochemical anomalies in the Urals can be associated with external cosmic events [3] and meteorite bombings.

Conclusions: The studied metal microparticles were formed in the earth's atmosphere during flight and splashing of a meteorite body. This event occurred on the border of the Moscovian - Kasimovian boundary and had an impact on local climatic features, which was reflected in the negative anomalies of $\delta^{13}\text{C}$. Thus, one of the causes of paleoclimatic changes on Earth could be extraterrestrial processes associated with strictly periodic motions of the solar system in the Galaxy, the deposition of cosmic dust and meteorite bombardments of the Earth. The presence of microparticles of cosmic origin in sedimentary strata can be a new tool for stratigraphic correlation of sections, lead to a revision of models of biotic crises and the identification of their causes, and also be used as an indicator of impact events.

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References: [1] Fayek M. et al. 2012. *Earth Planet. Sci. Lett.*, 319-320: 251–258. [2] Sungatullin R.Kh. et al. 2017. *Russian Geology and Geophysics*, 58: 59-69. [3] Gillman M., Erenler H.. 2008. *Int. J. Astrobiol.*, 7: 17–26.