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Arkhaean and Early Proterozoic continental biota of Baltic schield (the evidences from ancient weathering crusts)

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Abstract

The only reliable evidence of the existence of Early Earth continental conditions are weathering crusts that often are the only source of information about exogenous processes and subsequently about conditions under which the development of biosphere occurred.

Weathering is widely occurred on a surface as the first stage of litho genesis. Sediments, formed under the influence of weathering, are reported in Archean age structures. Weathering profiles in all geological settings are reliable witnesses of continental regimes and in Precambrian structures they often give unique information about continental features which led to life forming. Suggestions about the existence of Early Precambrian cratons on land have been made only by relying on a study of the elemental and isotopic correlations of C, H, N and P in the rock matter. So the presence of microbial mats on the land surface as early as 2.7-2.6 GA is affirmed [1]. But the fossilized remains of Precambrian land microorganisms have not been discovered till 2008 [2].

As a result of our investigations of the described weathering crust samples, a complex of diverse fossil microorganism remains was found. There are filaments, coccoids (diameter up to 5μm) and large (diameter >10 μm) spherical forms, fossil biofilms, etc. among this complex. Rather often the rocks practically consist completely of destroyed cocci, dumbbell-like forms and shreds of filaments.

As a result of these investigations it is ascertained that morphological diversity of bacterial forms of life existed by the Early Precambrian. Bacteria found in the objects of hypergene origin testify to the exogenous nature of the studied objects. In the Early Precambrian, microorganisms (bacteria, perhaps cyanobacteria, and perhaps even eukaryotes) accompanied and promoted the formation of weathering crusts. So it is possible to speak about the colonization of land by microbes at this time and about the existence of a single series from weathering crusts (paleosols) to real soils.

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References

[1] Watanabe, Y., Martini, J.E.J., Ohmoto, H.: Organic and carbonate-rich soil formation 2.6 billion years ago, Nature, vol. 408, pp. 576-578, 2000.
[2] Rozanov A. Yu., Astafieva M. M., Vrevsky A. B., et al.: Microfossils from the Early Precambrian Continental Crusts of Weathering of the Fennoscandian Shield, Otechestv. Geol., no. 3, pp. 83–90, 2008.