



## **Uranium, yttrium, and rare earth elements accumulation during the Cretaceous anoxic events in carbonaceous rocks in the Pacific Ocean**

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We have studied the carbonate-siliceous section of paleoceanic Albian-Cenomanian deposits on the Kamchatsky Mys peninsula (Eastern Kamchatka, Russia) [1]. The section is represented by a rhythmic alternation of planktonic limestones and jaspers, accumulated in the open ocean environment. The rhythmicity can be attributed to climate variations that reflect a fluctuation of astronomical parameters (Milankovitch cycles) [2, 3]. The section contains two beds enriched in organic carbon, corresponding to the two oceanic anoxic events - MCE and OAE2 [3]. The maximum content of organic matter in those beds reaches 68%.

Our geochemical studies revealed an enrichment of the carbonaceous rocks in some major and trace elements including PGE, in comparison with the surrounding limestone and jasper [4]. The accumulation of the ore elements in carbonaceous beds is caused by euxinic conditions during sedimentation. The content of uranium, yttrium, and rare earth elements in carbonaceous rocks is up to 60, 142 and 312 ppm respectively. Phosphate grains (bone detritus) with microinclusions of yttrium and uranium minerals were revealed in the carbonaceous rocks using the scanning electron microscope. These data prove the hypothesis of the sorbtion of U and Y by phosphate detritus from seawater. Microprobe analysis also showed an increased content of Cu, Zn, V in some pyrite framboids, which indicates that these elements are fixed in rocks by Fe-sulphide phase or organic matter under euxinic conditions. Our research may bring us closer to understanding the mechanism of syngenetic accumulation of metals in the black shales.

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