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Iridium anomaly in the Cretaceous section of the Eastern Kamchatka

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The origin of iridium anomalies is widely discussed with regard to massive fauna and flora extinction at several geologic boundaries. Two hypotheses are most popular, cosmogenic and volcanogenic. Anomalies of iridium are known at many stratigraphic levels, both at the geologic series borders and within geologic series. Our studies revealed increased content of iridium in a section of Cretaceous oceanic deposits on the Kamchatsky Mys Peninsula (Eastern Kamchatka, Russia).

The investigated section (56°03.353´N, 163°00.376´E) includes interbedded jaspers and siliceous limestones overlaying pillow-basalts. These deposits belong to the Smagin Formation of the Albian-Cenomanian age. In the middle and upper parts of the section two beds of black carbonaceous rocks with sapropelic organic matter were observed. Their formation marked likely episodes of oxygen depletion of oceanic intermediate water (oceanic anoxic events). Our geochemical studies revealed an enrichment of the carbonaceous beds in a number of major and trace elements (Al2O3, TiO2, FeO, MgO, K2O, P2O5, Cu, Zn, Ni, Cr, V, Mo, Ba, Y, Zr, Nb, REE, U, Au, Pt etc.) in comparison with associating jaspers and limestones. There are likely different sources which contributed to the enrichment. It is possible however to correlate the excess of Al, Ti, Zr, Nb with volcanogenic admixture, which is absent in limestones and jaspers. A possible source of the volcanogenic material was local volcanism as suggested by the close association of the investigated section with volcanic rocks (basaltic lavas and hyaloclastites). The basalts of the Smagin Formation were previously proposed to originate during Cretaceous activity of the Hawaiian mantle plume (Portnyagin et al., Geology, 2008).

Neutron activation analysis indicated increased up to 9 ppb concentration of Ir at the bottom of the lower carbonaceous bed (inorganic part of the sample was analyzed comprising 46% of the bulk rock). In other samples Ir content was below the detection limit of the technique (< 2 ppb). The iridium anomaly was found for the fist time in sedimentary section in Kamchatka. This anomaly correlates in the studied section with a positive shift of d13C. Taking into account radiolarian age data (Palechek et al., 2010) this allows to correlate the anomaly with the Middle Cenomanian oceanic anoxic event (MCE).

In our interpretation, the formation of the carbonaceous beds could be related to local outbreaks of volcanism which resulted in upwelling of deep waters enriched by mineral substances, sharp increase of plankton biological productivity and oxygen depletion of intermediate waters. Anoxic conditions favored enrichment of the sedimentary deposits in PGE sourced from lavas and hyaloclastites. Thus, iridium anomaly which has been found in Cretaceous sediments in Kamchatka, likely originates from a local volcanic source.

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