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Carbon isotope curve and iridium anomaly in the Albian-Cenomanian paleoceanic deposits of the Eastern Kamchatka

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We studied Albian-Cenomanian paleoceanic carbonate-siliceous deposits of the Kamchatsky Mys Peninsula (Eastern Kamchatka, Russia). They are deposited in association with pillow-basalts and hyaloclastites. The thickness of the studied section is about 10 m. The deposits are represented mainly by rhythmical intercalation of red-brown radiolarian jaspers, pink nannoplankton limestones as well as siliceous limestones. In the middle and upper parts of the section there are two beds enriched by organic carbon. The largest organic matter contents in this beds amount to 68%. The calculated values of the hydrogen and oxygen indexes indicate that the carbonaceous beds consist of marine organic matter. The accumulation of the carbonaceous beds reflects oxygen depletion in intermediate oceanic waters (ocean anoxic events, OAE). The structure of the studied section emphasizes its similarity to the contemporary deposits recovered by ODP and DSDP sites on Hess and Shatsky Rises.

Two orders of rhythmicity were observed in the section. The rhythmicity of the first order (average thickness of a rhythm is 5-7 cm) is an alternation of reddish brown radiolarian jaspers and pink nannofossil limestones. The rhythmicity of the second order is characterized by an increase in thickness of the jasper or limy layer in every 4th-5th rhythm of the first order and marked by an elevation of the silica content in calcareous layers. The rhythmicity formation can be attributed to fluctuation of astronomical parameters (Milankovitch cycles) with periods of 21 and 100 kyr. The character of atmospheric circulation and ocean currents served as transmission link.

The section was sampled layerwise and more than 100 samples were taken. The radiolarians were extracted from the samples of jaspers and siliceous limestones lying between carbonaceous beds. The educed radiolarian complexes allowed us to define the age of the deposits as Cenomanian. For more detailed dating of members of the section we have determined contents of carbon and oxygen stable isotopes in limestones and have compared the received results to isotope curves of other regions. In studied section the curve of d13C is characterized by a clearly expressed positive shift at the level of the lower carbonaceous bed. Below it and in the overlapping stratum of siliceous limestone (1 cm thickness) d13C has the values of 1.9-2.1 pro mille and above it d13C increases up to 2.5-3 pro mille. The precise d13C maximum after a sharp shift is correlatable with the form of a d13C curve of the Middle Cenomanian Tethyan sections. Accordingly, it is possible to assert, that the lower carbonaceous bed was formed during the mid-Cenomanian anoxic event (MCE). Gradual increase of d13C in the upper part of our section is similar to change of d13C in Upper Cenomanian fragments of Tethyan sections, i.e. the lower carbonaceous bed corresponds to anoxic event at the Cenomanian/Turonian boundary (OAE2).

Neutron activation analysis indicates 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). This anomaly correlates in the studied section with a positive shift of d13C. Taking into account radiolarian age data this allows to correlate the anomaly with the MCE. A source of iridium and other elements of the platinum group could be basalts and hyaloclastites from the eruptions during the sedimentation period. Anoxic conditions promoted deposit enrichment in ore elements.

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