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Cyclostratigraphic study of the Upper Cambrian deposits of the Kulyumbe key section (NW of the Siberian platform) aimed to constrain the duration of magnetic zones and δ ^{13}C SPICE anomaly

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One of the most practically significant tasks in paleomagnetism is the development and constant refinement of the magnetostratigraphic scale. On the one hand, this makes it possible to correlate sedimentary sequences outside a single sedimentation basin, and on the other hand, determining the position of the boundaries and duration of magnetic polarity zones on the geochronological scale provides important information about the dynamics of processes occurring in the inner shells of the Earth.

The cyclostratigraphic method makes it possible to construct an age model of a sedimentary section with a resolution unattainable by geochronological methods. It is based on recording in sedimentary rocks a signal of climate variations forced by cyclic changes of the Earth's orbital parameters (ellipticity of the orbit, obliquity, precession angle). This is a kind of “pulse” that allows you to move from the thickness scale to the time scale when studying a sedimentary section.

However, such a time-calibrated signal still remains unattached to the geochronological scale. To do this, the signal needs to be anchored by a well-dated event, such as a stage boundary, a volcanic event, or a peak in a stable isotope ratio curve (so called “isotope anomaly”).

Summarizing the above, in theory, cyclostratigraphic studies make it possible to determine the exact age of the boundaries of magnetic zones, their duration, and also to assess the completeness of the stratigraphic record.

The δ^{13}C SPICE (Steptoean positive isotope carbon excursion) anomaly has been described in many Cambrian sections of the world, including on the Siberian Platform. Here it is recorded in the terrigenous carbonate section of the Yurakhian horizon of the Kulyumbe Formation, the lower boundary of which correlates with the lower boundary of the Paibian Stage of the Cambrian and has an age of 497 million years.

Our report will present the first results of a preliminary cyclostratigraphic study of the Yuryakhian horizon of the Kulyumbe Formation of the Kulyumbe river section and its application to constraint the duration of the SPICE anomaly as well as long interval of the magnetic polarity both recorded in these sediments [Kouchinsky et al. 2008]. Data on the magnetic susceptibility (MS) of rocks were used as a proxy. MS variations have a distinct cyclic nature, well coinciding with the cyclicity observed in the section, expressed in the color and composition of the rocks. This fact gives grounds to consider MS to be the primary characteristic of sediments. MS, in turn, mainly depends on the concentration and mineralogical composition of iron oxides, which are sensitive to climate change.