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Extraterrestrial iron in the Cretaceous-Danian sediments

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Abstract

The composition and distribution of particles of native iron in eight sections of the Cretaceous-Danian sediments in the Caucasus, Crimea and Kopet Dagh were studied using thermomagnetic analysis up to 800°C. Iron particles are found in 330 of 571 tested samples, their percentage varies from 10-5 to 0.05%, and their distribution is bimodal. It was established that the Santonian sediments of the Caucasus and Kara-Kala are enriched with the iron particles; the upper boundary of these sediments is marked by a sharp drop in the iron content at approximately 84 Ma, which coincides with the upper boundary of the Dzhalal hyperchron. The variations in the Curie point of iron from 680°C up to 780°C reflect the fluctuations of the nickel admixture. A peak of the elevated iron content with nearly constant nickel of 5% was found in all studied sections, i. e., this is a global effect. The global pattern of the distribution and composition of the iron particles clearly indicates that their origin is associated with cosmic dust. At the same time, the particles of Ni-Fe alloy and pure nickel are very rare, and their concentration does not correlate with the content of iron particles. Apparently, there are very few Ni-Fe and pure nickel particles in cosmic dust, and, most likely, the particles of Ni-Fe alloy are mainly due to impact events.

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