Petromagnetic analysis of the K/Pg boundary layer of Gams (Eastern Alps) and other K/Pg sections

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We present results of detailed petromagnetic and microprobe studies of the sections Gams-1, Gams-2 and other K/Pg sections - Teplovka (Volga region), Koshak (Mangyshlak) and Tetritskaro (Georgia). We used petromagnetic studies included measurements of specific magnetic susceptibility, hysteresis characteristics and magnetic anisotropy of samples. The hysteresis characteristics of the samples were analyzed by a coercivity spectrometer. The ratios of hysteresis parameters Hcr/Hc and Mrs/Ms provide constraints on the domain state, i.e., the sizes of magnetic grains. Measurements on the coercivity spectrometer are used to obtain curves of isothermal magnetization of superparamagnetic particles. Thermomagnetic analysis (TMA) of samples was conducted with the help of express Curie balance by measuring the temperature dependence of inductive magnetization at a heating rate of 100 degree C/min. The concentrations of magnetite, titanomagnetite, metallic iron, hemoilmenite, and goethite in samples was estimated by determining from the TMA curves, the contribution to magnetization of a given magnetic mineral and dividing this value by the specific saturation magnetization of this mineral. A microprobe analysis of the magnetic fraction extracted from several samples was also performed.

Intense accumulation of iron hydroxides is observed at the K/Pg boundary, and most likely this a global phenomenon unrelated to local physiographic conditions of accumulation of terrigenous material in sediments. Apparently, most of iron hydroxides accumulated in the K/Pg boundary layer and other deposits have different origins: they are products of hydrothermal activity in the first case and terrigenous activity in the second. Accumulation of iron hydroxides extended in time attains a maximum in the lower part of the boundary layer and sharply drops upon the transition to over- and underlying deposits of the Danian and Maastrichtian. The base of the boundary layer **J** (Gams-1) is enriched in titanomagnetite grains of volcanic origin. Titanomagnetite was accumulated through eolian precipitation of products of a volcanic eruption. The related process of eruptive activity was short and local. The jump in titanomagnetite accumulation at the base of the boundary layer (Gams-1) is unrelated to impact events; indicators of the latter (the presence of metallic nickel and its alloy with iron) are confined to the upper part of the layer **J**, whereas the interval of a higher concentration of iron hydroxides covers the entire thickness of the boundary layer. Moreover, an abrupt rise in the iron hydroxide concentration is noted in all of the aforementioned sections, whereas metallic nickel is found only in the Gams section. None of the sections studied yields evidence for enrichment in cosmic metallic iron particles at the K/Pg boundary; on the contrary, in the boundary layer they are met mostly in its upper (Gams-1) or lower (Gams-2) part. Therefore, the K/Pg boundary is not marked by direct indicators of an impact event. Thus, only the enrichment in iron hydroxides of predominantly hydrothermal origin can be regarded as a global phenomenon, consistently associated with the K/Pg boundary and unrelated to impact events. The observed pattern of different positive correlations between accumulated iron hydroxides, magnetite, titanomagnetite, and metallic iron point to different implications of redeposition for the accumulation of these minerals, ranging from the initial accumulation stage, when the correlation is absent due to their different primary sources, to formations in which redeposited material plays a significant role. Very likely that single grains of nickel and Ni-Fe alloy in some layers of Danian sediments (Gams-1) are result of redeposition from boundary layer.

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Artikel/Article: Petromagnetic analysis of the K/Pg boundary layer of Gams (Eastern Alps) and other K/Pg sections 34