IRIDIUM DISTRIBUTION IN THE PEAT LAYERS FROM AREA OF TUNGUSKA EVENT. - M.I.Korina, M.A.Nazarov, L.D.Barsukova, I.V.Suponeva, G.M.Kolesov, and E.M.Kolesnikov*. - Vernadsky Institute of Geochemistry and Analytical Chemistry, USSR Academy of Sciences, *Geological Department, Moscow State University, Moscow, USSR.

The Tungusca event of 1908 was interpreted as a result of an explosion of a cometary body in the atmosphere, and no apparent extraterrestrial material was found in the area of the event. However the investigation of the Antarctic ice layer deposited in 1908 showed that the ice is slightly enriched in Ir [1]. The Ir anomaly was considered to be resulted from the Tunguska event. Preliminary Ir test of 3 peat samples from the area of the Tunguska event did not show high Ir concentrations relative to the Ir crust abundance [2]. In the present work we studied in detail á distribution of Ir and other elements in the peat deposits from the epicenter of the Tunguska catastrophe.

The collected core of the peat had section of 100 cm^2 and depth of 61 cm. There is a fire layer at the bottom of the core. The upper boundary of permafrost occured at the depth of 51 cm at the time of sampling (17 July 1983). The peat age was determined by method [3]. The peat layers in the studied interval were found to be deposited from 1875 to 1953. The peat bed of 1908, i.e. the catastrophe layer, was estimated to be in the interval of 43-46 cm (Fig.). The collected 15 peat samples were burnt and their ashes were analyzed by INAA and RNA.

The background level of Ir concentrations in the peat was determined to be 3,8±1,8(16)ppt. The catastrophe layer contains 17,2 ppt of Ir that is higher than the 3σ deviation from the background mean value. The high Ir concentration of 11,5 ppt was found at the base of the peat core in the fire layer (Fig.). When compared to [2] our data show the similar Ir content in the catastrophe layer, but our background Ir level is significantly lower than Ir content determined by [2] in the peat which overlaps the catastrophe layer. Other elements do not mark the catastrophe layer. Their concentrations are practically constant through the peat core, but all of them as well as Ir content are enriched at the bottom of the core in the fire layer. It is interesting also that Ce and K contents are higher below the permafrost boundary than upper it.

Total amount of Ir in the peat can be expressed as a sum of extraterrestrial and terrestrial Ir. Contribution of the extraterrestrial Ir one can estimate from the steady-state influx of 2 10^{-8} g/cm^2y of C1 component [1]. The calculated amount of the extraterrestrial Ir is usually less than 1% of the measured Ir amount. To estimate contribution of the terrestrial Ir in the peat we suggested that the terrestrial Ir amount depends on concentration of the peat ash. Taking into account the mean value of 20 ppt and the 2σ interval of Ir abundance in crust material [4] one can calculate the contribution of the terrestrial Ir based on the ash content in the peat. The measured Ir concentrations through the peat core are higher than the plausible Ir concentrations computed from the Ir crust mean, but they reside into the 2σ confidential interval except of the Ir content in the catastrophe layer (Fig.). Thus the Ir content in the catastrophe layer can be considered as anomalous relative to both the local Ir peat background and the crust Ir abundance. It means that the Ir anomaly cannot be produced by contribution of the most abundant crust rock components in the catastrophe layer.

Other possibilities to be considered are that the Ir anomaly was formed by chemical fractionation during the peat formation or by contribution of extraterrestrial material. The process of chemical fractionation must lead to change of the peat chemistry as it takes place at the permafrost boundary and in the fire layer (Fig.). In this respect the Ir enrichment accompanied by enhancement of other element contents in the fire layer could be caused by chemical fractionation resulted from a forest fire. In contrast, the catastrophe layer is not characterized by any anomalous element concentrations, except of the high Ir content. It suggest that the Ir anomaly could not be resulted from chemical fractionation of terrestrial material, and therefore the extraterrestrial origin of the Ir anomaly seems to be more plausible. The absence of high Co and Fe contens in the catastrophe layer (Fig.) is compatible with the extraterrestrial source of Ir because the excess extraterrestrial concentrations of Co and Fe must be very low when compared to the terrestrial Co and Fe contents. The extraterrestrial reason for

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the Ir anomaly is supported by anomalies of hydrogen and carbon discovered by [5] in the catastrophe layer.

The occurence of the Ir anomaly in the layer deposited in 1908 assumes that it could be formed as a result of the Tunguska event. Amount of extraterrestrial Ir in the catastrophe layer can be estimated as $8,4 \cdot 10^{-13}$ g/cm^2 that corresponds to $1,7 \cdot 10^{-6}$ g/cm^2 of C1 material. If the amount was the same all over the Earth surface then total mass of C1 material would be $8,7 \cdot 10^6$t. It is close to the C1 mass of $7 \cdot 10^6$t estimated from the Ir amount in Antarctica [1] and to the dust amount of 10^6 t measured in the atmosphere after the Tunguska event [6]. The mass of the Tunguska bolyd computed from the explosion energy of 10^{23} -10^{24} ergs and the bolid velocity of 40 km/s is $0,01-0,1 \cdot 10^6$t that is comparable with those estimations. It suggests that the Tunguska bolid had the C1 composition and was distributed equally through the Earth surface after its explosion. Another possibility is that the Tunguska bolid was represented by poor in C1 material cometary projectile, but the collision event was accompanied by influx of extraterrestrial dust. This version has advantages because it is difficult to suppose, that the material of Tunguska bolid could be distributed equally through the Earth surface. Moreover the "light nights" indicating appearence of dust in the atmosphere were noted before the Tunguska explosion [6].

Thus we conclude that the Tunguska collision can be considered as cometary event which was accompanied by influx of extraterrestrial dust. The dust as well as the Tunguska bolid itself could be formed by destruction of a cometary body.

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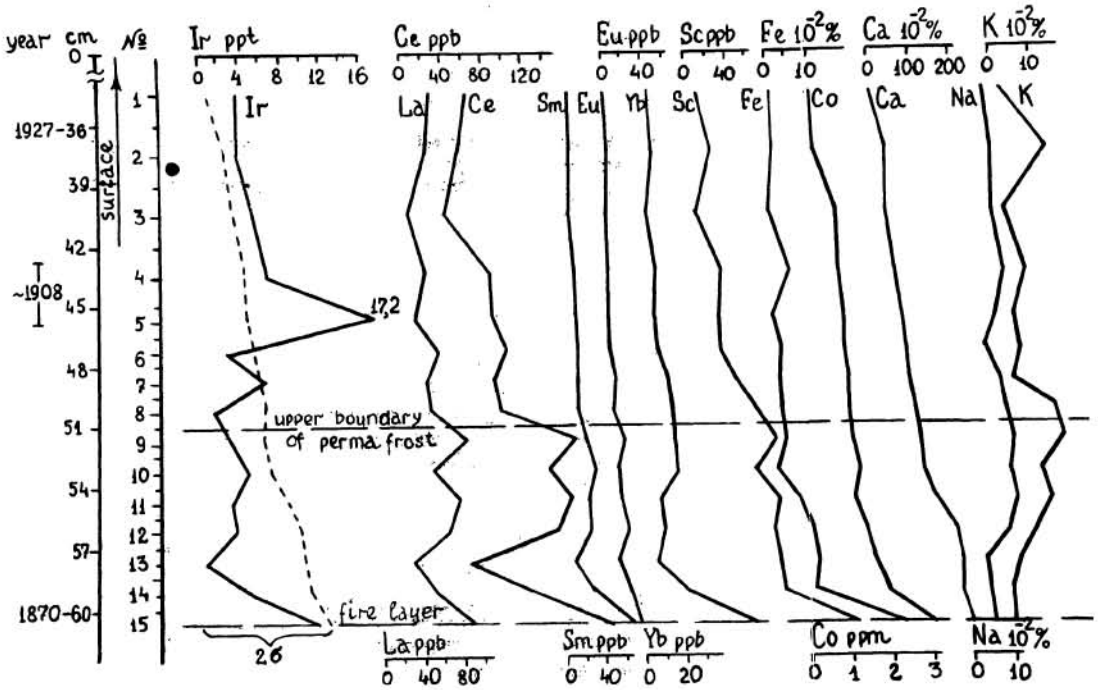

Fig. Element distribution in the peat core from the area of the Tunguska event

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