# Interaction between a meteoroid-superconductor[1], the atmosphere and the magnetic field of the Earth (new hypothesis about physical nature of the Tunguska phenomenon)[2]

Andrei E. Zlobin

*Planetary Defence Centre*
*Leningradskaya 24, 141400, Khimki, Moscow Region, Russian Federation*
*e-mail: z-tunguska@yandex.ru*

*Abstract.* In this article the idea of superconductivity in meteorites is declared for the first time. A new electro-magnetic mechanism of destruction of the most dangerous metal asteroidal bodies is described. It is shown that the nucleus of a long-period comet can include fragments with ultra low temperatures. Such fragments are able to be in a superconducting state. The presence of cometary ice and superconductivity of a meteor body is accepted in order to explain a powerful explosion during the Tunguska event in 1908. The accumulation of electrical energy in a meteoroid-superconductor is described during its motion with a cosmic speed across the magnetic field of the Earth. The influence of Joule heating is taken into consideration. The interaction between the magnetic field of a meteoroid-superconductor and surrounding plasma is described from the point of view of the magnetohydrodynamics theory.

*Keywords*: superconductivity, superconductor, accumulator, meteorite, meteoroid, meteor body, asteroidal body, metal, comet, long-period comet, planetary defence, cometary ice, dust, ultra low temperature, absolute zero, Tunguska event, 1908 event, Tunguska phenomenon, magnetohydrodynamics, MHD, cosmic speed, magnetic field, electric current, electrical resistance, electrical conductivity, metal vapours, Joule heat, explosion, electromagnetic pulse, Lorentz force, Meissner effect, shock wave, plasma, plasma deceleration, T-layers

The Tunguska meteor body was assumed to be originally the nucleus of a comet, most probably a long-period comet. Here we accept the following model of the structure of the cometary nucleus: it is an asteroidal body which is surrounded by the matrix of cometary ice and dust. In accordance with its physical properties, the material of this asteroidal body is supposed to be a superconductor just like metals are superconductors. The calculation of unsteady temperature distribution in the nucleus of a long-period comet demonstrated that the most part of such a body will be in condition close to absolute zero. In this case, an asteroid is in a superconducting state. As soon as a cometary nucleus contacts dense atmospheric layers, its ice matrix will separate and evaporate very quickly. Thus, only the asteroidal body will continue its further movement into the atmosphere. As the heating of the surface layer of dense meteoroids during their movement in the atmosphere is negligibly small, the asteroidal body will remain in a superconducting state. The plasma shell that appears around a metal meteor body will obtain a high electrical conductivity state due to the

---

[1] We have confirmation. In accordance of predictions of this article, recently it has been experimentally confirmed that meteorites sometimes contain naturally occurring superconductors.
https://link.springer.com/article/10.1007/s10948-016-3708-7
https://www.pnas.org/content/117/14/7645

[2] It is the translation from Russian into English of a published paper of Interdisciplinary Scientific-Technical School-Seminar "Nonperiodic Rapid-flowing Phenomena in Surrounding", 1988, April 18-24, Volume 3, pp. 214-215, Tomsk Department of Siberian Branch of Academy of Sciences of the USSR, Tomsk Polytechnic Institute, Tomsk.

addition of metal vapours. In this case, on the way of a meteoroid-superconductor moving with a cosmic speed through the atmosphere and the magnetic field of the Earth at an angle, in the system of meteoroid-plasma an induction electric current will occur. The Lorentz force will affect the meteoroid as well. It will lead to a significant deceleration and alteration of the flight trajectory of the meteoroid. During its flight, the meteoroid-superconductor will accumulate some portion of electrical energy like an accumulator-superconductor. In the case of exceeding one of the critical parameters of superconductivity or in the case of destruction of the meteoroid under the influence of external or internal (electrodynamic) forces, the superconductivity will disappear at an instant. The restoration of electrical resistance of the meteoroid will lead to an instant transition of accumulated electrical energy into Joule heating and explosion-like evaporation of the meteoroid as the consequence of that. The explosion will take place in the field of the ponderomotive force which will affect the direction of the explosion. The explosion will be accompanied by a strong electromagnetic pulse and an intense flash of light. The cloud of a thin-sprayed metal aerosol formed together with the explosion will be ejected to a high altitude and dissipated over a large area.

A simple mathematical model developed on the basis of the Tunguska phenomenon hypothesis has shown the results of the calculations that are in good compliance with the actual data. Along with that, the offered hypothesis allows us to explain some specific abnormal phenomena in the atmosphere. One of the characteristic features of a superconductor is that an external magnetic field, the magnetic field of the Earth in our case, almost does not penetrate into its body. The lines of the magnetic field are bending around the superconductor as it is shown in the left picture. This phenomenon named as the Meissner effect is explained by the fact that when a superconductor is exposed to an external magnetic field in its surface layer a non-fading electric current occurs, thus compensating that magnetic field completely. The very own magnetic field of a meteoroid-superconductor caused by the presence of its own electric current is able to interact with high electrical conductivity plasma which surrounds the meteoroid. It is known that in experiments on plasma deceleration with the help of a magnetic field, under specific conditions behind the front of a shock wave a complex luminous layered structure is observed. “T-layers”, as they call this structure, are formed due to the local effect on electrical conductivity plasma caused by Joule heating and electromagnetic braking force. It is entirely possible that this specific luminous structure shown in the right picture, which at present is considered as related to abnormal phenomena, is the result of the interaction between surrounding the meteoroid-superconductor plasma and the magnetic field of the meteoroid itself and may be explained as the result of the “T-layers” occurrence.