

Anomalous meteors from the observations with super-isocon TV systems

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There is a range of both optical and radar observations of meteors the behavior of which essentially differs from the behavior of most meteors. In some cases such meteors cannot be explained in the frame of the classic physical theory of meteors, in other cases the meteors are just of rare type. First of all these are the meteors with true hyperbolic velocities. In spite of the fact that most of hyperbolic orbits are the results of calculation errors, the meteors with extremely high velocities appreciably exceeding the hyperbolic limit of 73 km/s exist and can be of interstellar origin [1–3]. Another very rare phenomenon describes the possible cluster structure of meteor streams, which could be connected with the ejection of the substance from the cometary nucleus shortly before collision of the particles with the Earth [4]. Among anomalies connected with the meteor motion in the atmosphere one can note, first of all, the ultra-high altitudes of meteor beginnings exceeding 130–140 km [5–7]. Some other observations point to the beginning heights of bright meteors from Leonid shower on altitudes near 200 km [8]. The classic physical theory of meteors cannot explain their radiation on such high altitudes because of low air density [9]. Recently the results of TV observations of meteors with diffusive and cloudy structure appeared [9,10]. The results of observations in which, according to author's opinion, the meteors have a few kilometers transverse jets [9–11] were presented as well. There are video frames with bright meteor obtained with high temporal resolution, where authors declared the radiation, which could be an effect of a spread directly of the shock wave [12].

During many years' double-station observations of meteors which have been carrying out at Astronomical Observatory of Kyiv National Taras Shevchenko University the ultra-sensitive TV transmitting tubes of super-isocon type were used [7]. Given type of the tube is one of the most sensitive in the world, but has significant geometrical and photometrical distortions. This is the reason why most of registered anomalies in the observed meteors were supposed to be the artifacts of TV system, not analyzed in details and not published yet. In the light of recent observation described above we considered it relevant to carry out new complete review and reprocessing of the meteors with probable anomalies. These are hyperbolic meteors; meteors with the beginning heights exceeding 135 km (mainly meteors from Perseid and Leonid showers); climbing meteors (i.e. meteors increasing their altitudes over sea level); meteors absolutely without the visible atmospheric train; a meteor with the light curve which has a global depression in its midway, i.e. when a meteor after reaching of maximal brightness totally disappeared, and then flamed a new; a few Leonid meteors with nebula structure at the beginning of the trajectory; some twinkling Leonid meteors etc. The aim of this paper is to detach the true anomalous meteors from artifacts of the observational TV system, to classify types of anomalies and present qualitative analysis of these phenomena. In future we plan to give the quantitative analyses and propose the physical models to explain the meteor anomalies.

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