

THEORETICAL ESTIMATION OF METEOR RADIANT WIDTH FOR SHOWERS PRODUCED BY SYMPLE COMET DISASTER. A. V. Bagrov¹, N. A. Sorokin¹, G. T. Bolgova¹, A. P. Kartashova¹, V. A. Leonov¹. ¹Institute of Astronomy of Russian Academy of Science, Moscow, Russian Federation. e-mail abagrov@inasan.ru.

Modern cosmogony claims that comets are no doubt parent bodies for most known meteor showers [1]. Comet nuclei are primordial bodies of the Solar system and must be mixture of frozen volatiles and refractory particles. For billions years they can be preserved unchangeable at the outer parts of the Solar system, but when they move closer to the Sun, the solar radiation evaporates volatiles and releases refractory intrusions. Evaporated gases leave comet nucleus at the speed up to several hundreds meters per second [2], but extremely rarefy gases can drag away the heavy particles only at low speed. Therefore most members of created meteoroid stream should possess nearly the same orbital parameters as the parent comet had. Computer modelling of this process was used to estimate geometric parameters of simulated meteor showers. The model includes escape velocities from 0.1 to 100 m/s at aphelion, at perihelia and at the distance 1 a.e. from the Sun. Orbits with semi-axes of 2.62 a.e. (as Delta Aquarids), 11.5 a.e. (as Leonids) and 28 a.e. (as Perseids) were studied. Tiny changes of the velocities lead to a creation of very thin pipes for changed orbits. It results in production very compact radiants of simulated showers that vary their widths from few arc-seconds for escape velocities of 10 cm/s to several arc-minutes for 100 m/s independently on the orbit semi-axes. It is much less than visible radiant width for any known meteor showers. The diameter of tube of the orbit's set at distance 1 a.u. from the Sun is very narrow too: the Earth should crosses it in few minutes. Actually, the Earth crosses such narrow stream as Leonids within two hours. Thus, computer simulation shows that simple disintegration of a comet nuclei can lead to a creation of meteor showers with radiants that are much narrower then the really existing once. Hence, we came to a conclusion that the visible meteor showers were had been processed by some extra mechanism that broadened their radiants. The most realistic one might be gravitational perturbation of particle orbits at close passages near the Earth, because it can change a direction of the particle move up to several degrees. As the Earth gravitation is effective only inside the Hill's sphere, hundreds and thousands revolution periods around the Sun are needed to broaden an initially narrow radiant to the sizes observed at present. Any change of orbital velocity is accompanied by change of orbital period, therefore swallow of particles stretches along its orbit with the time. For example, nowadays Leonids swallow with the average orbital period of 14244 days became long enough for Earth to cross it three subsequent years. Due to narrowness of the swallow

each year's passage lasts two hours only. Comparison of length and width of the swallow allows us to estimate the age of Leonids shower as $5 \cdot 10^5$ years.

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References: [1] Kulikova N. V., et al. (1993). *In Cosmogony of minor bodies. Kosmosinform*, 176 pp. (in Russian). [2] Bisikalo D. V., Shematovich V. I. (1987). *Astron. Cyr.* N 1507. (in Russian)